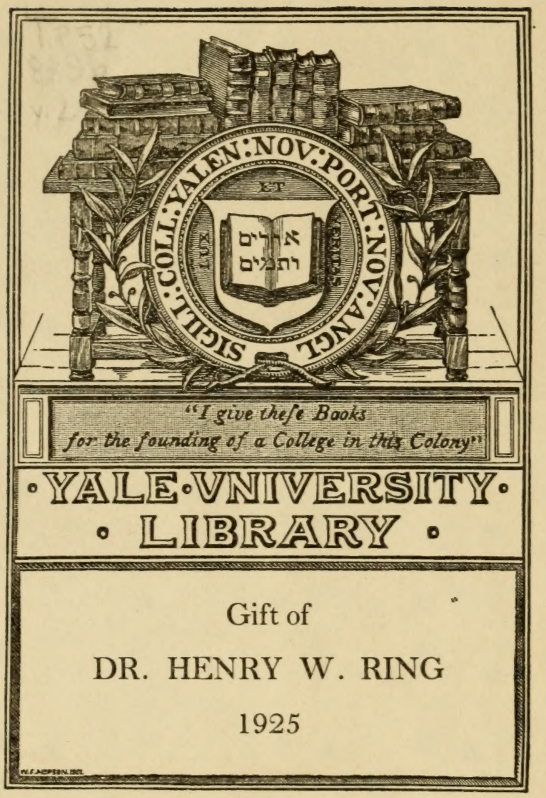

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A

TREATISE ON DISEASES

OF THE

NOSE AND THROAT

IN TWO VOLUMES

BY

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Volume Two

DISEASES OF THE THROAT

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PREFACE.

In the preparation of this, the second and concluding volume of this work, I have followed the same general plan that was observed in the arrangement of the first volume. The first section is devoted to the consideration of diseases of the fauces, including under the term that region which includes the oropharynx, the soft palate and faucial pillars, and the tonsils. The term fauces is not, perhaps, one in general use, yet I have adopted it as best describing in a single expression that portion of the air and food tract which includes the above organs. The second section is devoted to diseases of the larynx, while a third section is added, in which the various surgical procedures are described which are resorted to for obtaining access to the oro-pharynx and larynx, and which involve cutaneous section. In the nomenclature and classification of diseases of the oropharynx and larynx, much difficulty has been encountered on account of the large number of names which have crept into our literature as describing oftentimes the same disease; while quite as common a source of confusion, perhaps, is in the fact that we find entirely different diseases described by various writers under the same designation. In order to eliminate as far as possible these sources of confusion, I have adopted the general rule of using such names only as in themselves both locate and describe the morbid process. Thus, the term acute subglottic laryngitis, for instance, is used to designate what in the older literature, in most instances probably, was termed catarrhal croup. We thus substitute for the very vague and indefinite nomenclature one which not only locates the morbid process, but also defines its character. In this manner I have rejected such terms as granular pharyngitis, clergyman's sore throat, relaxed throat, ulcerous sore throat, etc. The only exception to the rule, perhaps, is in the use of the term follicular as applied to the pharynx and tonsils. The term follicular pharyngitis or follicular

tonsillitis is vague, the former being used to designate a morbid process of the lymphatics, the latter a croupous exudation. These expressions, however, have come into such general use in medical literature that I have not felt at liberty to discard them.

It is a source of regret that the appearance of this volume should have been so long delayed, the first volume having appeared two and a half years since. How unavoidable this delay has been will be fully appreciated when it is remembered that I have only been able to devote to its preparation the leisure intervals in my somewhat busy professional work. I can only bespeak for it the same friendly spirit in which the first volume was received.

I desire to again acknowledge my indebtedness to my associate, Dr. E. B. Dench, for the same valuable assistance here that he rendered in the preparation of the previous volume.

F. H. B.

26 West 46th St., New York.
July 1st, 1892.

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Section I.

Diseases of the Fauces.

DISEASES OF THE FAUCES.

CHAPTER I.

THE ANATOMY OF THE FAUCES.

THE term fauces is perhaps a somewhat unfortunate one, and yet we use it here in lieu of any better, as embracing that region in the back of the throat and oral cavity which contains the lower pharynx or, as it should be termed, the oro-pharynx, the soft palate, the uvula, the tonsils, and the glosso-epiglottic fossæ. These various structures are so intimately associated in the performance of their various physiological functions that they really constitute an independent and separate portion of the air and food tract. We shall therefore reach a far more intelligent comprehension of these functions by grouping the parts together and designating the region which they constitute as the fauces. The method of examination of this portion of the upper air tract has already been sufficiently described in the previous volume.

This region we may describe as lying immediately behind the oral cavity, and constituting a somewhat quadrilateral-shaped space, which is bounded posteriorly by the oro-pharynx and anteriorly by the cavity of the mouth, while its roof is formed in front by the soft palate and uvula and behind by an imaginary plane which extends from the free border of the soft palate to the post-pharyngeal wall, thus dividing the oro-pharynx from the naso-pharynx. Its floor may be described as extending from the orifice of the œsophagus to the root of the tongue, including in this region the arytenoid cartilages and commissure, the orifice of the larynx, the crest of the epiglottis, and the lingual or hyoid fossæ.

The special parts which call for description are the oro-pharynx, the soft palate and uvula and pillars of the fauces, and the tonsils.

THE ORO-PHARYNX.—The oro-pharynx is usually described as constituting a region or space in the upper air and food tract.

For all proper clinical consideration, it is quite sufficient, I think, simply to describe what is usually regarded as its posterior wall.

This constitutes a quadrilateral area, extending from the prominence of the axis to the orifice of the œsophagus, or, as Luschka[1] prefers to describe it, from the base of the uvula to the posterior extremity of the great cornua of the hyoid bone. It is concave from side to side, and slightly so from above downward. Its length in the average adult varies from 1¾ to 2⅛ inches, while its width is from 1⅜ to 1¾ inches. It is formed of three layers—the mucous membrane, the submucous fibrous layer, and the muscular structures.

The Mucous Membrane.—The mucous membrane is of the type ordinarily found in the food tract, in that it is covered with squamous epithelium, and is thin, somewhat attenuated, dense in structure, and closely adherent to the parts beneath. It is the usual practice to describe two varieties of glands as being found in this membrane, the ordinary acinous glands and the ductless follicles. Until we have further evidence as to the glandular character of these ductless follicles, I think we are hardly justifiable in designating them as true glandular structures. Hence, we content ourselves with the assertion that we find in this region or membrane a certain number of acinous glands or ordinary muciparous glands and in addition to these, scattered in the deeper layers of the membrane in considerable but somewhat varying numbers, lymphoid follicles. The acinous glands are of the ordinary compound racemose variety, such as is found in all mucous membranes.

The lymphoid follicles are scattered somewhat irregularly throughout the deep layers of the membrane, although they show a tendency to aggregate themselves on either side of the pharynx, in rows, as it were, parallel with the posterior pillars of the fauces. They are also somewhat thicker in the upper portion of the pharynx, where they seem to form outlying portions of the large mass of lymphoid tissue which constitutes the pharyngeal tonsil.

The Fibrous Layer.—The fibrous layer separates the mucous membrane from the muscular tissues. It forms a thick aponeurotic structure where it is attached to the basilar process above, but gradually becomes thinner below and is lost as it approaches the œsophagus.

The Muscular Layer.—Immediately beneath the fibrous layer we come upon the constrictor muscles of the pharynx, the superior, middle, and inferior (see Fig. 1).

The superior constrictor muscle is quadrilateral in shape, and arises from the lower third of the margin of the internal pterygoid plate and its hamular process, from the contiguous portion of the palate bone, and the reflected tendon of the tensor palati, from the

[1] "Anatomie des Menschen," Tübingen, 1862, vol. i., p. 219.

pterygo-maxillary ligament, from a portion of the alveolar process of the inferior maxilla, and by a few fibres from the side of the tongue. From these various points, the fibres curve backward, and are inserted into the median raphé, and also, by means of a fibrinous aponeurosis, into the pharyngeal spine of the occipital bone.

The middle constrictor muscle overlaps partially the superior constrictor at its lower part. It arises from the whole length of

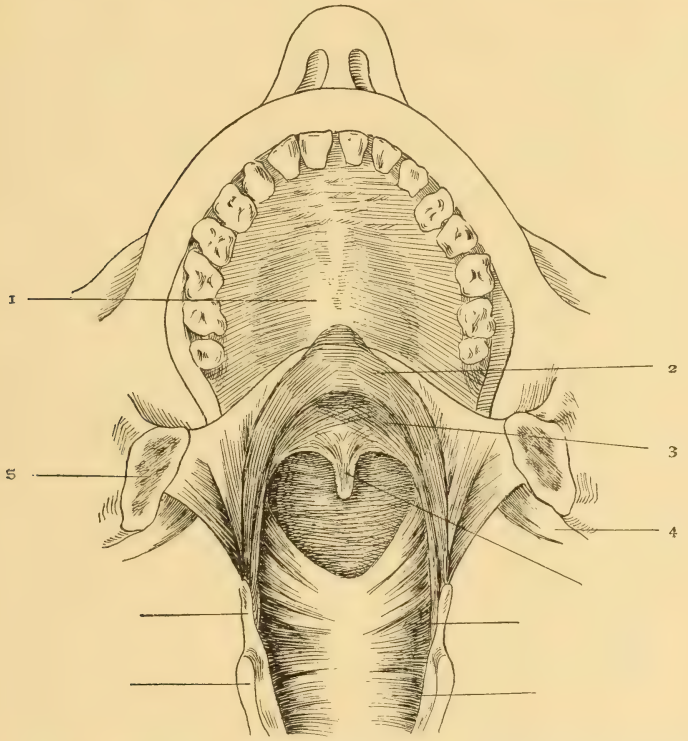

FIG. 1.—The Muscles of the Soft Palate and Pharynx, seen from the front. 1, Hard palate; 2, palato-pharyngeus; 3, levatores palati; 4, internal pterygoid; 5, inferior maxilla; 6, azygos uvulæ; 7, middle constrictor; 8, inferior constrictor; 9, thyroid cartilage; 10, superior cornu of the thyroid.

the greater cornu of the hyoid bone, from the lesser cornu, and from the stylo-hyoid ligament. The fibres of this muscle diverge from their origin, and are inserted into the posterior median raphé of the pharynx.

The inferior constrictor muscle arises from the side of the cricoid and thyroid cartilages, the fibres curving backward to be inserted into the median raphé of the pharynx. The lower fibres blend with the muscular tissues of the œsophagus, while the upper overlap those of the middle constrictor. Immediately beneath the

latter two of these muscles, and separating them from the body of the vertebra on either side of the median line, are found the longus colli and the rectus capitis anticus major muscles, while between the superior and middle constrictors courses the slender body of the stylo-pharyngeus muscle, which, arising from the inner side of the styloid process, passes downward and is inserted partially into the posterior portion of the thyroid cartilage and is partially merged in the constrictor muscles.

The muscular movements of the pharynx proper are thus provided for by the three constrictor muscles, which practically constitute one muscle divided into three portions. These would seem to be arranged in such a way as to give the most vigorous constrictor action, together with a firm support of the pharyngeal wall, which is still further secured in that the muscular layers overlap each other between each of their divisions. Thus, the lower border of the superior contrictor is overlapped by the superior border of the middle, and, in the same way, the upper border of the inferior muscle notably overlaps the lower border of the middle. That this support is not always thoroughly efficient, however, is shown in a very curious case reported by Ogle,[1] in which a pouch was formed, the size of a small hen's egg, by the protrusion of the pharyngeal wall at the border of the inferior constrictor muscle, through which the food passed into the œsophagus. In this case, the rupture seems to have been through the muscular walls, in that the aponeurosis in this region is exceedingly thin.

Nerves.—The nerve supply of the pharynx is derived mainly from the glosso-pharyngeal nerve and the pharyngeal plexus. These supply the mucous membrane with general sensation and the constrictor muscles with motion, the lower constrictor receiving some additional innervation from the external laryngeal nerve.

The Plica Salpingo-Pharyngea.—Laterally the walls of the pharynx curve forward to the fold formed by the reflection of the mucous membrane over the palato-pharyngeus muscle, constituting the posterior palatine pillar. In the hollow of this lateral concavity there is found a slightly projecting fold of the mucous membrane, which extends from the posterior lip of the Eustachian orifice downward until it is lost in the parts below, thus forming in its upper portion the anterior border of the fossa of Rosenmüller.

This was first observed by Tortual[2] and subsequently more fully

[1] Trans. of the Pathological Soc. of London, 1865–66, vol. xvii., p. 141.

[2] "Neue Untersuchungen über den Bau des menschlichen Schlund- und Kehlkopfes." Leipsic, 1846, p. 6.

described by Luschka.[1] Zaufal[2] has studied it more largely in its clinical aspect. It is usually designated as the plica salpingo-pharyngea, while Allen,[3] in a most interesting study of the anatomy of the soft palate, alludes to it as the salpingeal pharyngeal fold.

Properly speaking, this fold belongs to the lateral walls of the naso-pharynx, although in many instances it can be observed extending down into the oro-pharynx. It consists essentially of a fold of mucous membrane, although this is thrown into greater prominence by the rich distribution of lymphoid follicles which are found imbedded in it, this latter feature giving it its clinical importance, in that when these follicles are in a state of chronic inflammation it constitutes one of the forms of pharyngitis lateralis.

Arteries.—The blood supply is derived from the ascending pharyngeal, which, having its origin in the external carotid artery,

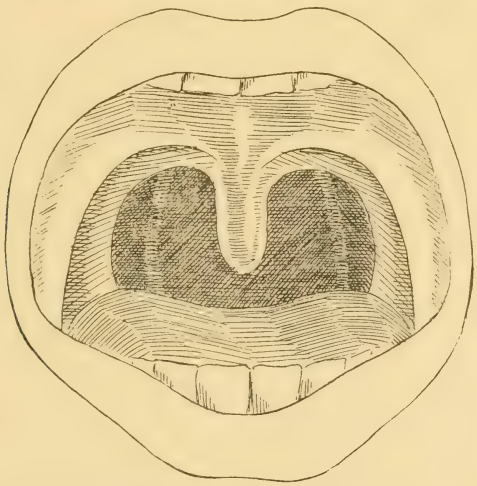

FIG. 2.—Ascending Pharyngeal Arteries of Abnormal Size. (Farlow.)

passes up through the deeper tissues of the neck, and, coursing along on the belly of the stylo-pharyngeus, sends branches both to the constrictor muscles and to the mucous membrane of the pharynx.

In addition to this, a certain amount of arterial supply is derived from the terminal branches of the internal maxillary, viz., the vidian, the descending palatine, and the arteria pharyngea suprema; and from the facial, viz., the ascending palatine and tonsillar arteries; and also from certain terminal twigs of the thyroid arteries.

The ascending pharyngeal artery, although a vessel of some

[1] "Der Schlundkopf des Menschen," Tübingen, 1868.

[2] Arch. für Ohrenheilkunde, 1880, vol. xii., Nos. 2 and 3.

[3] Trans. Amer. Med. Assoc., 1872, vol. xxiii., p. 547.

size, is not ordinarily visible on direct inspection of the pharynx, and yet a number of cases have been reported in which the artery was of such abnormal size, either on one or both sides, as to render its pulsations visible on direct inspection. Farlow[1] reports five cases of this kind, all occurring in females, in two of which the artery was visible on both sides (see Fig. 2), two on the right side alone, and in one on the left side of the pharynx. Sanderson[2] has made a similar observation in a female aged sixty, the artery in this case being the size of a crow-quill, while Creswell Baber[3] has cited a case of a pulsating vessel, the size of a slate pencil, occupying the position of the left salpingo-pharyngeal fold, which he believed to be an enlarged ascending pharyngeal artery.

Veins.—The veins form a dense network spread out in the fibrous layer, the blood being collected by venous channels which follow the general course of the arteries. Those on the lateral wall of the pharynx empty into the facial vein, while those from the upper part empty into the internal jugular or the inferior petrosal sinus.

Lymphatics.—The lymph-vessels form a network which lies partially in the submucous tissue and partially in the deeper layers. With these last, some of the follicles which are seen on the posterior wall of the pharynx are in communication. This occurs largely at about the level of the third cervical vertebra, where the greater number divide into two sets, which lie on the lateral walls of the pharynx, at a varying distance from the median line. Here they are in communication with the small lymphatic glands, which are covered by the rectus capitis anticus major muscle. On the right side the lymphatic channels empty into the right ductus lymphaticus, while on the left side they empty into the receptaculum chyli.

THE SOFT PALATE, UVULA, AND PILLARS OF THE FAUCES.—Attached to the posterior wall of the hard palate, and projecting backward and downward, is a soft, flexible fold, composed of aponeurosis, muscular tissue, and mucous membrane, which is designated as the velum pendulum palati or soft palate. To the centre of this, posteriorly, is attached a projecting portion, to which the name uvula is given, while laterally it is reflected to the side of the fauces in two folds, the anterior and posterior palatine arches, the whole constituting both anatomically and physiologically a single organ. The aponeurosis of the soft palate consists simply of a fibrous layer, which is attached to the hard palate anteriorly, and is gradually lost as it approaches the posterior border. The mucous mem-

[1] Boston Med. and Surg. Jour., 1887, vol. cxvi., p. 302.
[2] Brit. Med. Jour., 1887, vol. ii., p. 625.
[3] Brit. Med. Journal, 1887, vol. i., p. 626.

brane of the lower or oral surface of the palate is covered with squamous epithelium, as forming part of the food tract, while that of its upper surface is endowed with columnar ciliated epithelium, in that it belongs essentially to the air passages.

It is endowed with both muciparous glands and lymphoid follicles. The only peculiarity about the muciparous glands, as Rüdinger[1] has observed, lies in the fact that they are imbedded deeply within the tissues, extending even down to the muscular tissue, whose fibres interlace about them in such a way that muscular contraction has a tendency to increase the secretion of mucus, or to press it out, as it were, upon the surface of the membrane.

The glands are distributed somewhat evenly throughout the membrane, with the exception that at the free border of the palate and in the uvula no gland structures are found. Furthermore, at the extremity of the uvula, the mucous membrane is much thicker than at other portions of the velum, and of a less dense structure, an anatomical condition which tends to explain the facility and frequency with which an œdematous swelling occurs at this point.

The muscles which are of importance as giving movement to the soft palate and uvula are the azygos uvulæ, tensor palati, levator palati, palato-glossus, and palato-pharyngeus (see Fig. 1), somewhat in the reverse order of their importance.

The azygos uvulæ is not a single muscle, but in most cases consists of two distinct bundles of muscular fibres, which, arising from the posterior nasal spine of the hard palate and from the contiguous aponeurosis of the soft, pass downward and are inserted into the tip of the uvula. Rüdinger[2] has demonstrated a muscle which he calls the azygos uvulæ inferior, which runs from the mucous membrane of the tip of the uvula, upward, to be inserted into the anterior surface of the soft palate.

The tensor palati, or better, perhaps, as indicating its origin, the spheno-salpingo-staphylinus muscle, arises on either side, from the outer third of the membranous wall of the Eustachian tube, and from the long groove at the base of the internal plate of the pterygoid process. From these origins, the fibres ascend vertically on the outer side of the pterygoid process, and are converged into a round tendon, which winds around the hamular process from without inward, being separated from this process by a small bursa. After passing along the hamular process, the round tendon is spread out into a broad, flat aponeurosis, a portion of which is inserted into the posterior border of the hard palate, the other portion blending with the aponeurosis of the corresponding muscle of the opposite side.

[1] Allg. Wien. Med. Ztg., 1877, p. 396.

[2] Loc. cit.

The levator palati or petro-salpingo-staphylinus arises from the flat surface near the apex of the petrous portion of the temporal bone, and from the cartilaginous and membranous wall of the Eustachian tube. Its fibres spread out, the upper being inserted into the aponeurosis of the muscle just described, and the lower into the free border of the palate near the base of the uvula, the fibres from each side interlacing with those of the other. Laterally, some of the fibres blend with fibres of the palato-pharyngeus muscle.

The palato-glossus arises from each side of the base of the tongue, as a thin flat bundle of muscular fibres, some of the fibres coming from the stylo-glossus muscle. From these origins the fibres ascend vertically to the anterior surface of the soft palate, where they are inserted, blending with muscular fibres of the opposite side. This muscle is covered with mucous membrane, and projects into the fauces, forming at the end a sharp, thin fold leading in front of the tonsil, forming the anterior pillar of the soft palate.

The palato-pharyngeus muscle forms with its fellow, as it were, a girdle of muscular fibres, which arises principally from the anterior surface of the soft palate, immediately beneath the mucous membrane, blending with the anterior fibres of the tensor palati. A few fibres also arise from the posterior surface of this muscle. From this origin the fibres run downward and backward to the posterior and inner side of the thyroid cartilage. Some of the posterior fibres run as far back as the posterior wall of the larynx, blending with fibres of the salpingo-pharyngeus muscle when this muscle is present. This muscle, as it passes down behind the tonsil, forms, with the mucous membrane which covers it, another sharp fold, which projects into the fauces, constituting a posterior pillar of the palate or, as it is sometimes designated, the posterior pillar of the fauces. At the side of the soft palate, and immediately in front of the anterior palatine pillar, a slight sulcus is formed between the projecting pillar and the fold of the mucous membrane which is reflected from the soft palate to the alveolar process of the lower jaw. Luschka[1] makes a passing allusion to this region, while Allen[2] attributes a certain amount of importance to it, in that a wound in this region might easily set up a troublesome staphylitis. Allen gives to this sulcus the name of the pre-coronoid space, on account of its relation to the coronoid process of the inferior maxilla.

Arteries.—The arterial supply to the palate is derived from the internal maxillary artery, through the descending palatine, and

[1] Loc. cit. [2] Loc. cit.

from the external maxillary or facial, through the ascending palatine. This last forms an intimate anastomosis with the tonsillar artery, also a branch of the facial. The lingual and ascending pharyngeal arteries also contribute slightly to the arterial supply.

The Veins.—The veins on the posterior surface are continuous with the veins of the nasal mucous membrane. On the anterior surface they are more numerous, and empty into the pterygoid plexus and into the pharyngeal veins.

Lymphatics.—The lymphatics of the soft palate are very numerous, and form an anterior and posterior network, which are continuous with those of the base of the tongue on the one hand and of the nasal mucous membrane on the other. This lymph plexus is connected with the larger lymphatic glands, which lie in the neighborhood of the bifurcation of the common carotid artery, and of the greater cornu of the hyoid bone.

Motor Nerves.—The motor nerves are derived from the third branch of the fifth, which supplies the tensor palati, a branch of the vagus, which through the pharyngeal plexus supplies the azygos uvulæ, the levator palati, and the palato-pharyngeus. The glosso-pharyngeus supplies the palato-glossus muscle. The facial nerve also probably sends motor branches to this region.

Sensory Nerves.—The sensitive nerves are derived principally from the second division of the fifth, with some branches from the vagus and glosso-pharyngeal nerves.

Anomalies.—In the process of development of the palate, various anomalies have been met with, which, while of more interest perhaps from an anatomical point of view, yet possess a certain pathological importance. In most of these there is no evidence whatever of any attempt on the part of nature to repair the difficulty, and yet occasionally an effort in this direction is observed, as for instance in the case of cleft palate, which Passavant[1] believes may undergo spontaneous cure, both before and after birth, an observation fully confirmed by Trélat,[2] who has reported the case of a man, aged forty-three, in whom spontaneous union had occurred in a cleft which had extended through both the soft and hard palate. Some twenty-one years later, the same patient coming under observation, Trélat[3] discovered a small perforation in the line of the original cleft, immediately in front of the uvula, which apparently had resulted from the absorption of the cicatricial tissue. A somewhat similar observation has been made by Wolff.[4]

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[1] Arch. für klin. Chir., 1865, vi., p. 333.
[2] Bull. de la Soc. de Chir., 1867, 2 s., viii., p. 450.
[3] Union Médicale, 1888, vol. vii., p. 279.
[4] Berlin. klin. Wochensch., 1882, vol. xix., p. 582.

While this anomaly is quite frequently met with in the soft palate, it is not the province of this work to enter into any full discussion of the subject.

Bifid uvula is perhaps the most frequent anomaly met with in the soft palate, and yet in a very large number of cases that have come under my own inspection I have never yet seen a case which required operative interference on account of any symptoms directly dependent upon the condition. Trélat[1] regards this condition as one closely associated with cleft palate, considering both as to an extent hereditary, in support of which view he cites the instance of a father who had rudimentary bifurcation of the uvula, and a deficient hard palate, whose child also had a bifid uvula, at the base of which, some time after birth, the mother noticed a small

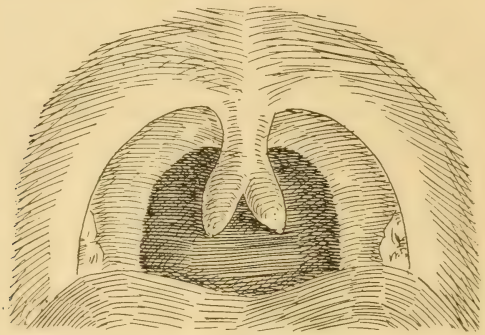

FIG. 3.—Bifid Uvula.

perforation develop, probably of the same nature as in the former case cited by Trélat.

The most common form of this anomaly is that in which a slight furrow is observed along the median line of the uvula, the organ terminating in two tooth-like projections. Shufeldt[2] reports a case in which each half was fully the size of a normal uvula.

Wolters[3] observed a case in which the palato-glossus muscle was endowed with a separate investment of mucous membrane, in such a way as to produce an elongated fenestra, as it were, through the anterior pillar of the fauces; the condition being observed on both sides of the fauces. Similar cases have been reported by Cohen[4] (see Fig. 4), Chiari,[5] and Schapringer,[6] while a

[1] Bull. de la Soc. Chir., 1867, 2 s., vol. viii., p. 450.
[2] N. Y. Med. Journal, 1885, vol. xli., p. 723.
[3] Zeit. für Rat. Med., 1859, 3d series, vol. vii., p. 156.
[4] N. Y. Med. Record, 1878, vol. xiv., p. 44.
[5] Monatschrift für Ohrenheilkunde, 1884, vol. xviii., p. 141.
[6] Ibid., p. 203.

like condition, as confined to one side of the fauces, has been observed by Claiborne.[1] Schmiegelow[2] has seen a similar anomaly in the posterior pillar of one side. In a case reported by Schapringer[3] the abnormal opening in the faucial pillar extended only through the mucous membrane of its anterior face, thus forming a blind pouch, as it were, whose depth was limited by the thickness of the pillar. This anomaly furnishes us a suggestion, perhaps, as to the

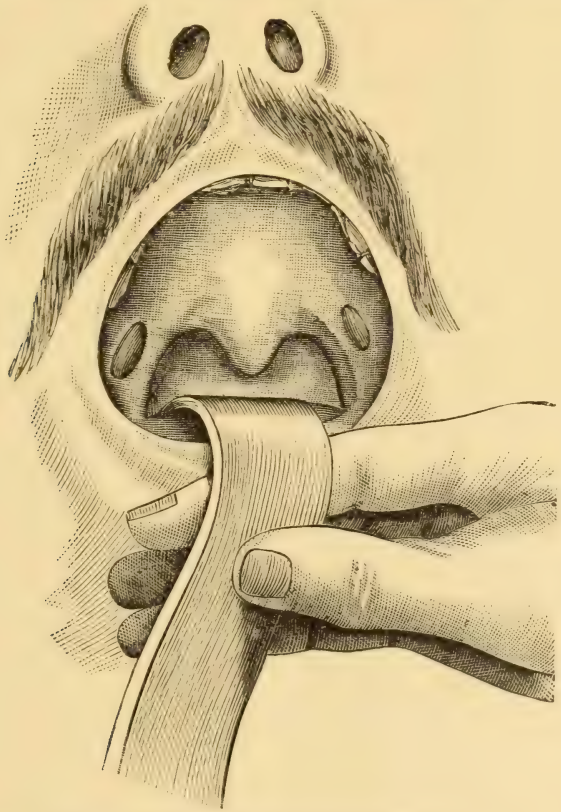

FIG. 4.—Separate Mucous Investment of the Palato-glossus Muscles of Each Side. (Cohen.)

origin of the curious diverticulum or pouch-like cavity described by Watson.[4]

In this case a narrow slit-like orifice was seen on the free margin of the posterior pillar of the fauces on the right side, immediately behind the tonsil. The opening was not more than one-eighth of an inch in length, its edges being in contact. From this point, a diverticu-

[1] Amer. Jour. of Med. Sciences, 1885, new series, vol. lxxxix., p. 490.
[2] Monatschr. für Ohrenheilkunde, 1885, vol. xix., p. 35.
[3] Loc. cit.
[4] Jour. Anat. and Phys., London, 1874–75, vol. ix., p. 134.

lum extended to the manubrium sterni, occupying the space between the external and internal carotid arteries. As Watson suggests, it was probably due to a modification of closure of the first post-mandibular visceral cleft. It gave rise to no prominent symptoms during life and was discovered post mortem. Milliken[1] has observed, in a young woman of twenty-three, what seemed to be a broadening or expansion of the insertion of the anterior pillar of each side, into the sides and dorsum of the tongue, the result of which was that the movement of the tongue was somewhat hampered, its protrusion being attended with a drawing forward of the palate into the mouth. A somewhat similar condition, though in a more aggravated form, was observed by Illera[2] in a new-born child. In this case the tongue, in its middle third, was adherent to the alveolus of each side, the effect of the condition being to render the child unable to take nourishment until the adhesions were broken up.

THE TONSILS.—This is the name which is given to a mass of lymphoid tissue found between the two pillars of the fauces, and which is ordinarliy described as an almond-shaped organ, possessing a somewhat definite form and outline, while again it is referred to simply as a mass of glands situated in this region. Now, as a matter of fact, it is exceedingly difficult to describe with any degree of definiteness a typical tonsil, in that, owing to the peculiarity of its structure and the character of the tissue which enters into its composition, it undergoes certain progressive changes from birth to old age, which are inherent in and common to all lymphoid structures. Moreover, as has already been noticed in the discussion of adenoid disease,[3] these tissues are exceedingly liable to take on diseased action in early life, as the result of exposure, or perhaps from some systemic dyscrasia, in consequence of which it is not an easy matter always to determine whether the mass of tissue which we call the tonsil, in any individual case, is the result of regular and progressive development, or of diseased action.

Its antero-posterior boundaries are always limited by the two pillars of the fauces, while, as regards its vertical extension, an exceeding great difference is noted in individuals. This is more particularly referable to its lower border, for, whereas its upper border is limited by the convergence of the two faucial pillars in the soft palate, its lower boundary is to an extent unlimited, for we not unfrequently see it extending down beyond the base of the tongue, its normal boundary, and even sending prolongations as far as the lateral walls of the laryngeal cavity.

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[1] Cleveland Med. Gazette, 1885–86, vol. i., p. 170.

[2] Siglo Med., Madrid, 1887, vol. xxxiv., p. 201.

[3] Vol. i., p. 541.

As regards the anatomical relations of this organ, I know of no better description than that of Delavan,[1] as follows: "The relations of the tonsil to the internal carotid artery are not so intimate as commonly is supposed, for between the lateral wall of the pharynx, the internal pterygoid, and the upper cervical vertebra there is a space filled with cellular tissue, the pharyngo-maxillary interspace, in the posterior part of which are located the large vessels and nerves, and which lies almost directly backward from the pharyngo-palatine arch. The tonsil corresponds to the anterior part of this interspace, so that both carotids are behind it, the internal carotid one and five-tenths centimetres, the external carotid two centimetres, distant from its lateral periphery."

It is interesting to note in this connection, that in bovines, sheep, dogs, and cats its situation is identical with that in the human species. In the horse, the tonsils are situated in a groove, limited above by the posterior part of the soft palate, anteriorly by the base of the tongue, and below by the epiglottis. In the swine they encroach upon the soft palate, and meet in the median line. In the dolphin and porpoise they are placed on the anterior faces of the soft palate on either side.

Perhaps we can describe the ordinary type of tonsil, in the majority of individuals in adult life, as consisting of a small elongated, almond-shaped mass of lymphoid tissue, which presents on its outer surface from five to ten orifices, leading down into blind pouches, or pockets, the whole forming an organ, which lies deeply imbedded in the sulcus between the two palatine arches, and which, in the ordinary inspection of the fauces when at rest, does not project beyond the faucial pillars, and in fact is scarcely visible on gross inspection. I am disposed to think that the faucial tonsil in a healthy throat, constitutes an organ of but trivial significance, either from an anatomical, physiological, or clinical point of view. I have often made the assertion, that practically the tonsil does not exist in a healthy throat, meaning by this that this organ only posseses an interest to us, when it attains sufficient size to encroach notably upon the fauces, and to give rise to prominent morbid symptoms. That the tonsil, however, consitutes an intimate part of a healthy throat, can scarcely be questioned, in view of the admirable and exhaustive observations of Retterer[2] who has investigated this tissue as found in the healthy throat at all ages, from fœtal life up to advanced years. Fox[3] has called attention to the

[1] Arch. of Laryngol., vol. i., p. 339.

[2] "Évolution des Amygdales:" Comp. Rend. de l'Académie des Sciences, Paris, 1885, vol. ci., p. 1,284. "Origine et Évolution des Amygdales:" Journ. de l'Anatomie et de la Physiol., Paris, 1888, No. 1, p. 1.

[3] Jour. Anat. and Physiol., 1885–86, vol. xx., p. 559.

fact, that in the development of the fœtus, the epiblastic layer, which forms the mouth, and the hypoblastic layer forming the alimentary canal, meet at the faucial tonsil. According to Retterer[1] the development of the tonsil in man, consists in an involution of the epiblast into the hypoblast. From this single invagination secondary invaginations occur into the surrounding tissue as seen in Fig. 5. As development progresses the hypoblastic layer gradually grows in between these involutions of the epiblast, separating them one from another. The basement membrane of the epiblastic layer, quite early during the process, is lost, or becomes

FIG. 5.—Development of the Tonsil. Section showing Primary and Secondary invaginations (Retterer.)

so fused with the hypoblastic cells as to be indistinguishable. As development proceeds, the hypoblastic elements penetrate not only between the epiblastic involutions, separating them widely from each other, but now also penetrate between the individual cells (see Fig. 6). Gradually certain portions of this separating hypoblastic tissue become more condensed, giving rise to the lobular structure of the tonsil, this condensation taking place in the peripheral parts of the hypoblastic tissue; that is, in the parts most widely separated from the epithelial cell which is surrounded. As the enveloping tissue becomes more and more consolidated, the epithelial cells become compressed to such an extent that they

[1] Loc. cit.

undergo a retrograde metamorphosis or fatty degeneration, and finally disappear, leaving empty spaces, as it were (see Fig. 7).

FIG. 6.—Development of the Tonsil. Later Stage of Invagination, with Mesoblastic Infiltration. (Retterer.)

This occurs especially about the periphery of the organ, and gives rise to the lacunæ or minute spaces which are seen, under micro-

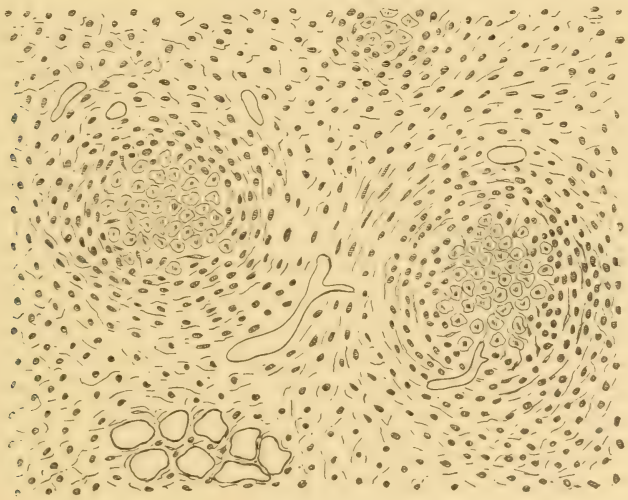

FIG. 7.—Development of the Tonsil. Commencing Degenerating. (Retterer.)

scopic examination, in a transverse section of the tonsil, the large ones being visible to the naked eye. It will be seen then, that ex-

cept very early in fœtal life, or in infancy, the mass of the tonsil is made up of hypoblastic tissue. This consists of cells, some round, others elongated or stellate, which, as seen by the microscope, constitute simply lymphatic tissue. Now, the development of the tonsil practically consists in the grouping together of these lymphatic cells into masses, constituting blind follicles or lymph nodules, these nodules being separated from each other by layers of connective tissue, the origin of this connective tissue being in the hypoblastic layer, the lymphatic cells of which have undergone transformation into connective-tissue cells. The whole mass of the tonsil, then, is made up of lymph tissue of this character, surrounding a somewhat varying number, from eight to twelve, deep, pouch-like cavities or pockets, the crypts of the tonsil, formed by the development of the original invaginations already described as commencing in fœtal life. The whole mass is covered by mucous membrane, which not only covers the face of the tonsil presenting in the fauces, but also extends down into the crypts of the organ. The mucous membrane is of the ordinary type, covered with epithelium, which is squamous on the surface, and becomes cylindrical in its deeper layers. We thus find the tonsil made up of a mass of lymphoid tissue in which the covering mucous membrane is arranged in such a way that these invaginations or crypts assume somewhat the form of a muciparous or secreting gland, with this difference, however, that the epithelium which lines the tonsillar crypts is not of the same character as that which we find lining ordinary muciparous glands, hence, the secreting capacity of these crypts is exceedingly limited, probably pouring forth nothing more than sufficient mucus to keep the surface moistened and lubricated.

Arteries.—The arterial supply is derived from the dorsalis linguæ, the ascending palatine and tonsillar, the ascending pharyngeal and the descending palatine arteries. The most important of these, probably, is the tonsillar, which enters the base of the tonsil at about the junction of its middle and lower thirds. This vessel possesses no especial importance in the healthy tonsil. When the organ, however, is largely hypertrophied, the artery assumes a considerable size, and may give rise to very troublesome hemorrhage after tonsillotomy. It should be observed, however, that it is only in adult life or soon after puberty that we find this artery sufficiently developed as to be the source of troublesome hemorrhage, which would seem to indicate perhaps that the blood-vessels of an enlarged tonsil in adult life are not only more extensive, but more thoroughly developed. Retterer[1] has shown that the general arrangement of the capillary network is such that the periphery of the lobules are

[1] Comp. Rend. de la Soc. de Biol., 1886, 8th series, vol. iii., p. 581.

more vascular than the centre. This appears clear from the description of the tonsil already given. In all forms of hypertrophied tonsils this really does not always hold.

Veins.—The veins terminate in the tonsillar plexus on the outer side of the tonsil.

Nerves.—The nerves are derived from the fifth and from the glosso-pharyngeal.

Lymphatics.—The gross distribution of the lymphatics has been sufficiently dilated upon in the description of the lymphatics of the pharynx. With reference to the termination of these vessels in the tonsil, Schmidt[1] believes that they open by their deep extremity into the reticulum of the blind follicles. Retterer,[2] however, has shown that the capillary network really occupies the entire follicular mass, forming a system of closed canals, which open neither by stomata or by their extremities.

Anomalies.—Claiborne[3] reports a case of congenital absence of both tonsils, a somewhat curious observation, and one which certainly would demand more than a simple gross inspection to determine. Jurasz[4] has described a unique condition, which came under his observation, which consisted of a pedunculated growth, attached to the posterior pillar of the fauces, and hanging down behind the base of the tongue so far that it could not be seen when the parts were at rest, although, when brought into view on contraction of the posterior pillars, it almost completely filled the faucial opening. It was removed by the galvano-cautery snare, and was shown on microscopic examination to consist of the lymphoid structure of the ordinary tonsil. In another instance Jurasz[5] has observed a somewhat similar sessile mass, which was attached to the right salpingo-pharyngeal fold, just below the orifice of the Eustachian tube, which was also shown to be composed of lymphoid tissue.

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[1] Ztg. für W. Zool., 1863, vol. xiii. [2] Loc. cit., p. 27. [3] Loc. cit.
[4] Monat. für Ohrenheilk., 1885, vol. xix., p. 361. [5] Loc. cit.

CHAPTER II.

THE PHYSIOLOGY OF THE FAUCES.

THE functions of the various anatomical parts which we have already described as entering into the formation of the fauces are co-ordinate, and are therefore necessarily grouped together for consideration, the function of the tonsils being reserved for special discussion. They are comprehended in the two physiological processes of deglutition and phonation or, more properly, articulation.

DEGLUTITION.—After the bolus of food has been sufficiently and properly masticated in the oral cavity, it is forced back to the faucial opening by the elevation of the tongue against the roof of the mouth, by the action of purely voluntary muscles. As soon as it reaches the base of the tongue, it is passed into the domain of muscles whose action is largely involuntary, from whence it is forced into the stomach by a series of progressive muscular contractions, somewhat vermicular in character. After the bolus passes the palato-glossus muscles, which form the anterior faucial pillars, these muscles contract in such a way as to prevent the mass returning to the oral cavity. Simultaneous with this movement, the posterior pillars of the fauces, or the palato-pharyngeus muscles, contract, shutting off the opening between the lower and the upper pharynx, preventing the food from making its way into the naso-pharynx. As these latter muscles contract, their edges are brought almost into parallelism from above downward, although it is probable that a slight opening is left at the apex of the arch, which is closed by the body of the uvula. It should be stated, however, that the function of the uvula is not of great importance in this connection, for, as we know, when this organ is completely amputated, the individual suffers no apparent inconvenience in the act of deglutition. This, however, is to be in part accounted for in the fact that the azygos uvulæ muscle extends above the edge of the soft palate, forming a ridge on its upper surface.

The contraction of the muscles which comprise the faucial pillars, both posteriorly and anteriorly, seems to be an involuntary or reflex movement, excited by the presence of the bolus of food,

in that it is not probable that these muscles can be brought into play, without the presence of something in the faucial isthmus. I think when one attempts voluntarily to go through the movements of deglutition it will be found impossible, until a little saliva is drawn down to the base of the tongue, to excite muscular contraction.

At the same time that the faucial pillars contract, the larynx is drawn up beneath the base of the tongue, by the action of that group of muscles which is attached to the hyoid bone, namely, the anterior belly of the diagastric, the mylo-hyoid, the genio-hyoid, the stylo-hyoid, and some fibres of the genio-hyo-glossus. This movement, which is also purely an involuntary one, accomplishes two purposes. By the raising of the larynx beneath the base of the tongue, the epiglottis falls over the laryngeal opening, thus preventing the entrance of food into the air passages. It has usually been considered that this was the main function of the epiglottis, although later investigation has shown that the importance of the epiglottis in this connection has been somewhat over-estimated, in that where this cartilage has been entirely destroyed by disease the particles of food are still excluded from the larynx, in deglutition, by the contraction of the aryteno-epiglottidean or laryngeal constrictor muscles. With the raising of the larynx, the pharyngeal wall is also elevated, this movement being aided by the contraction of the palato-pharyngeus muscle. This movement brings the constrictor muscles of the pharynx into such position that they grasp with ease the bolus of food, which, when seized, is carried down with the dropping, as it were, of the larynx, when the bolus is passed into the œsophagus and to the stomach.

ARTICULATION.—The column of air, emerging from the lungs, is thrown into vibration, by the action of the vocal cords, producing sound waves, and these are converted into articulate language by the movements of the soft palate, tongue, cheeks, and lips. The part which the soft palate and uvula play in this process has always been the subject of considerable speculation. The most rudimentary view in regard to this is that the soft palate hangs as a veil or curtain, as it were, between the oral and the nasal cavities, dividing the current of sound waves, and directing it according to will into one of these cavities or the other, thus regulating the character of the tone, producing in the one case nasal tones, and in the other case purely oral tones. The soft palate does vastly more than this, as is clearly shown in cases of cleft palate, or more particularly, perhaps, in cases of paralysis of the palate, following diphtheria, where the most marked effect on the voice is shown in the halting articulation, whereas the tone of the voice is not very

materially affected, unless possibly it assumes a somewhat nasal character.

In the voice we recognize three elements: pitch, volume, and quality or timbre.

Pitch is regulated by the tension of the vocal cords. The volume—or loudness, if you like—is regulated by the chest-muscles. The quality or timbre of a note depends upon the character of the instrument by which the sound waves are originally produced, as, for instance, we recognize the difference between the vibrations of the vocal cords and the vibrations of the reeds of the clarionet; but the quality or timbre of the voice is largely governed by the shape and character of the cavity through which the sound waves are projected, namely, the mouth, or, as it is technically termed, the vocal tube.

The function of the nasal chambers in voice production has already been discussed,[1] and need not be entered upon here further than to simply repeat that during phonation the column of air in these chambers is thrown into vibration, constituting what Helmholz called overtones. These overtones re-enforce and give a pleasing character to the tones of articulate speech produced by the varying shapes into which the oral cavity is formed, according to the different positions of the tongue, cheeks, soft palate, and lips.

In other words, articulate language is formed by altering the shape of the vocal tube by means of the mobile parts, such as the lips, tongue, palate, etc., through which phonative waves escape through the mouth, or, in other instances, by more or less completely shutting off its outlet. It is by the former of these positions that vowel sounds are produced, while consonants are formed by an interruption or complete arrest of the escape of phonative waves. Consonant sounds are divided usually into labials, dentals, and gutturals. The mechanism of the production of these sounds, however, belongs properly to the oral cavity. In the enunciation of the vowel sounds, the palate takes an exceedingly important part, in that its position varies markedly with the enunciation of each. This has been very clearly shown by the experiments of Czermak[2] who demonstrated that its greatest elevation occurred with the vowel sound ee, and the elevation gradually diminished when the vowels were uttered in the following order: i, oo, o, a, ah, the palato-pharyngeal space being completely closed in the utterance of the first two of these sounds, while it gradually opens as

[1] Vol. i., p. 88.

[2] "Ueber das Verhalten des weichen Gaumens beim Hervorbringen der reinen Vocale." (Sitzungsberichte der Wiener Akademie, mathematisch-naturwissenschaftliche Klasse, März, 1857), vol. xxiv., p. 4.

we go down the list. This closure is not due entirely to the action of the levator palati muscles in raising the palate, but is markedly aided by the formation of a transverse ridge across the posterior pharyngeal wall, at the point where the palate, in its elevation, impinges upon it. The existence of this ridge was first demonstrated by Passavant,[1] and subsequently confirmed by Gentzen,[2] Thechner,[3] Vogel,[4] and Joachim,[5] although Michel[6] and Lucæ[7] have been unable to demonstrate its presence, and Voltolini, while admitting its formation in certain cases, considers that it is not constant, even in the same individual, having observed it at one time, and in a subsequent observation upon the same subject being unable to confirm it.

In addition to the vowel sounds, the utterance of the gutturals is apparently aided by the movements of the soft palate, although probably this is in the main due to the fact that these sounds are formed by an exceedingly short vocal tube, this shortening being accomplished by the raising of the tongue against the soft palate.

We thus find that the oral cavity has to do almost entirely with the consonant sounds, by the varying shapes and capacity which is given to it by its mobile parts, the palate occupying almost entirely a passive position. In the utterance of the vowel sounds, on the other hand, the soft palate stands as a sort of valve, regulating the proportion of phonative waves which shall issue either through the nasal or oral cavities.

THE FUNCTION OF THE TONSILS.—The tonsils have, since the early days of medicine, afforded field for study, which, on account of the frequency with which they become the seat of morbid changes, has always been interesting, and yet, as the result of a total ignorance as to their true anatomical structure, have furnished us a number of most curious theories as to their special function in the economy. Thus, Vesalius,[8] Whorton,[9] Shaffenberg,[10] Morgagni,[11] and Haller[12] looked upon them as composed of ordinary glandular structure. Cuvier[13] and Meckel[14] described them as a

[1] Virchow's Archives, Berlin, 1869, vol. xlvi., pp. 1–31.

[2] "Observations on the Palate after the Removal of an Orbital Tumor," Königsberg, 1876.

[3] "Phonetics," p. 29.

[4] "Observations on the Pharynx of a Man with a Complete Defect of the Nose," Dorpat, 1882.

[5] Archives of Otology, vol. xviii., p. 226.

[6] Berl. klin. Woch., 1885, No. 41.

[7] Virchow's Archives, vol. lxiv.

[8] "De Humani Corporis Fabrica," Basileæ, 1543, Libri vii., p. 579.

[9] "Adenographia in Mangeti Biblioth. Anatom.," Genevæ, 1685, ii., p. 725.

[10] "Dissertatio de Tonsillis," Ienæ, 1704.

[11] "Epistolæ J. B. Morgagni in Valsalvæ Opera," Venetiis, 1740, p. 244.

[12] "Elementa Physiol.," Bernæ, 1764, p. 65.

[13] "Anat. Comp.," vol. iv., p. 438.

[14] "Anat. Comp.," French translation, vol. vii., p. 327.

collection of small pouches in the pharyngeal wall. Rapp[1] regarded them as follicles destined to secrete a lubricating fluid to moisten the bolus of food, and to facilitate its passage through the œsophagus.

These seem to have been the prevailing ideas in regard to the function of these structures until as late as 1862, when Frey[2] made the announcement that the tonsils were really composed largely of lymphatic tissue, an observation subsequently confirmed by Henle, who designates them as a conglobate glandular substance. His first gave the tissue the name of adenoid gland.

We thus find that the old idea that the tonsils constitute a mass of secreting glands to be an error, and that really they are made up of an aggregation of lymphatic nodules, and that their function is probably similar to that of Peyer's patches in the intestinal canal. Now, what the function of the lymphatic glands really is, remains still an unsolved problem. Drews[3] has shown that, if the lymphatic structures of the other portions of the body possess the function of reproducing white blood-corpuscles of the blood, the lymphatic structure of the tonsil serves the same purpose. Stöhr[4] has demonstrated, furthermore, that white corpuscles can make their way from the lymphatic tissue of the tonsil through the epithelium and into the free cavity of the pharynx. Hingston Fox,[5] after a somewhat elaborate study of these organs, arrives at the conclusion that they serve to reabsorb the salivary secretions from the buccal cavity after their work is done, thus preventing unnecessary waste in the economy; this action being of especial importance during the intervals of deglutition; secondly, that certain elements of food are absorbed in its passage through the fauces; and, thirdly, that they possess an important function in the reproduction of the white blood-corpuscles, or, as he rather poetically puts it, they act as "nurseries for young leucocytes, planted by the water-side, and drawing their sustenance from the nutrient stream." This view is still further indorsed by Scanes Spicer.[6]

We thus find that, with our more definite knowledge of the microscopic structure of the tonsil, we scarcely attain to any more specific information as to its principal function. Indeed, we are launched upon a still wider sea of speculation and thought, and yet, while probably for some time to come the question as to the cytogenetic function of the tonsil must still remain an un-

[1] Müller's Archives, 1839, p. 189.
[2] Vierteljahr. der Zürich. Natur-Gesellschaft, 1862, vol. vii., p. 410.
[3] Arch. für Mik. Anat, 1884, vol. xxiv., p. 338.
[4] Arch. für Path. Anat., 1884, vol. xcvii., p. 211.
[5] Journal of Anatomy and Physiol., 1885–86, vol. xx., p. 559.
[6] London Lancet, Oct. 27th, 1888, vol. ii., p. 805.

solved problem, I think its absorbent function must be accepted, for, while this is a function of no great importance in the general economy as a physiological process, the fact of its existence is rather strikingly shown as a pathological process, based on purely clinical grounds. Thus, Hill[1] lays special emphasis on the fact, which, by the way, Fox[2] had already noticed, that the tonsil supplies a favoring surface through which the materies morbi of scarlet fever and diphtheria makes its entrance into the circulation. This view certainly is very strikingly borne out by clinical observation, and yet the question arises here, whether the entrance of the germ is due alone to the absorbent character of the tissue, or whether its mechanical entanglement in the spongy structure may not go far toward aiding its entrance.

Swain[3] observes that, if the chief function of the pharyngeal tonsil is, as Killian[4] suggests, to destroy pathogenic germs inhaled in the inspired air, the faucial tonsils perform a similar office in protecting against organisms entering the mouth with the ingesta.

Killian's investigations have shown that man and the domestic animals, exposed as they are to the air of crowded rooms, containing a large number of micro-organisms, have been provided with a relatively large pharyngeal tonsil; while in animals in whom the nose is long and complicated, this adenoid tissue is absent, the nasal passages themselves filtering out the micro-organisms.

Hill has also made something of a point of the fact that the tonsil tissue possesses the property of converting starch into sugar, which suggests to him that this may be one of the physiological functions of the organ. Now, if, as Fox has shown, the superfluous saliva is absorbed by the tonsil, this amylolytic function might quite as well depend upon the absorbed saliva as upon any essential property of this kind in the lymphatic tissue itself.

We have arrived at the conclusion that the tonsil is an absorbent and not a secreting organ; and yet I think this statement must not be accepted as absolute, in that the peculiar form which the lymphatic tissue assumes in its development, viz., folds or ridges, as it were, gives rise to the mechanical formation of deep fissures and pockets, the so-called crypts in the tonsil, which constitute what are practically large tubular glands, although their secreting power is exceedingly limited. Whether they possess any function as such is probably not a safe statement; that they possess a secreting power, however, all must accept.

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[1] Brit. Med. Jour., 1888, vol. ii., p. 615. [2] Loc. cit.

[3] Swain: N. Y. Med. Jour., 1890, vol. lii., p. 317.

[4] Morphol Jahrb., Bd. xiv., S. 618.

CHAPTER III.

ACUTE PHARYNGITIS.

FOLLOWING out the general idea of the nomenclature of diseases which was used in the former volume, the term acute pharyngitis should be used only to describe an acute inflammation of a catarrhal nature, involving the mucous membrane of the lower pharynx. As a matter of clinical observation, however, I am disposed to think that an acute inflammation confining itself absolutely to this region seldom if ever occurs. We do, however, meet with an acute inflammation involving the pharynx in connection with the soft palate, uvula, and the pillars of the fauces—in fact, constituting an acute faucitis, which occurs purely as an idiopathic disease, and ordinarily as the result of some simple exposure. In general, however, it should be stated that I regard an inflammatory process of a catarrhal nature as a somewhat rare event in the pharyngeal mucous membrane. I think there can be no question that it has been too largely the practice, in former years, to casually glance into the pharynx, and to say that the parts are reddened, inflamed, congested, or relaxed, without always observing the tissue with sufficient care to determine absolutely the existence of these morbid conditions.

The faucial region is an exceedingly sensitive one, and any disturbance in this locality gives rise to sensations of a more or less distressing character. Moreover, when sensations are referred by the patient to the fauces, in the very large majority of instances, the primary source of the trouble is not in the pharyngeal mucous membrane, but, in most instances, probably in neighboring parts, such as the tonsils, the naso-pharynx, or the nasal cavity proper. An acute inflammation evidences itself by redness, swelling, heat, and pain, or, as the old writers put it, rubor, tumor, calor, cum dolore. The pain is present in these cases, but the other evidences of morbid process in the pharyngeal membrane are not present. Hence, I think, I am justified in this connection, in warning young practitioners especially against the danger of too readily making a diagnosis of a pharyngitis, from a hasty glance into the throat, with imperfect means of illumination, and to urge that a diagnosis

of an inflammatory process should only be made when the membrane presents an unquestioned condition of inflammatory redness and swelling. The pinkish tint which is found in the normal faucial mucous membrane is, generally speaking, common to all mucous surfaces. Hence if any question arises as to the existence of an inflammatory process in the pharynx, let it be compared with the normal pinkish tint which is observed in the sides of the cheeks or the inner face of the lip. If this is done in all cases, I think most observers will agree with me in the statement that an inflammatory process in the pharynx is an exceedingly rare occurrence, notwithstanding the fact that most of our standard textbooks on diseases of the throat seem to affirm the opposite opinion. I should mention, however, that these statements only refer to an acute idiopathic pharyngitis, and not to manifestations of the exanthemata, such as measles, scarlet fever, small-pox, typhoid and typhus fevers, as well as syphilis, which may be considered one of the exanthemata. The throat manifestations of these diseases I do not think should be properly classified under the term pharyngitis. The same, I think, may be said of the throat manifestations of gout and rheumatism. We might also include the so-called strumous throat, although I have for a long time considered what has been usually designated as strumous disease of the upper air passages as really due to congenital syphilis.

ETIOLOGY.—We restrict the designation of acute pharyngitis, then, to an acute idiopathic inflammation of the mucous membrane lining the pharynx and involving also the pillars of the fauces, the soft palate and uvula, and, to a certain extent, the tonsils in the same morbid activity. The attack undoubtedly may be caused by an ordinary exposure to cold, such as sitting in a draught or wetting the feet, or other similar indiscretions, and yet I think the mucous membrane here obeys the same rule as that which we have already enunciated in the first volume in regard to the mucous membrane lining the nasal cavity, and that is, that, as far as the upper air passages are concerned, an acute inflammation, in probably the very large majority of cases, is merely a lighting up of a chronic inflammation, or, in other words, that the chronic inflammation occurs first, and that the acute inflammation is superimposed upon it. Hence probably, in most instances, an acute pharyngitis results from a cold or some exposure, in which the local manifestation of the cold, fixing itself upon parts already weakened by the morbid process, attacks the mucous membrane of the fauces. Now, we have already made clear, I think, that the pharynx properly belongs to the food tract, and not to the air tract; certainly from an anatomical point of view this is true.

Hence a morbid process in this region does not occur always in connection with disease of the air passages, but rather with disease of the food passages. Moreover, the lower pharynx, as we shall discuss more fully in considering this queston of chronic pharyngitis, is in very close and intimate sympathy with the digestive apparatus, and hence is liable to be the seat of an inflammatory process, in connection with or in sympathy with some disturbance of the alimentary system. An acute pharyngitis, therefore, is usually met with as an exacerbation of a chronic pharyngitis, which is dependent upon a chronic gastritis or some other disturbance of the digestive tract, such as torpid liver, constipation of the bowels, etc. The faucial region is also the seat of an acute inflammatory activity in connection with a similar process in the air passages above. Most frequently, perhaps, it is met with as a complication of or as the result of an acute naso-pharyngitis, although with almost equal frequency it occurs in the course of an acute rhinitis. In these cases, however, the faucial symptoms are not usually so well marked as when the disease occurs idiopathically, in part, perhaps, because the acute inflammatory process above gives rise to so much discomfort that the pharyngeal disorder becomes masked to a certain extent, and secondary to the keener discomfort of the primary affection. Moreover, I do not think that an inflammation in the faucial region is by any means so well marked, or that the symptoms referable to the pharynx are to any degree painful. Mackenzie[1] states that it is most frequently met with among young people, and, furthermore, that sedentary habits, bad food, impure water, scrofulous diathesis, and syphilis act as predisposing causes. A somewhat similar view is advanced by Lennox Browne[2] and Sajous.[3]

I do not agree with the view that it is most common in young people. As we have already found in a previous volume, it is the glandular and lymphatic structures in young people which are most liable to be the seat of morbid action, while in adults it is the connective-tissue structures, among which we may class the mucous membrane proper, as one most liable to be involved in an inflammatory process. Hence in early life a pharyngitis takes on a follicular form, while in adult life a purely catarrhal pharyngitis is the rule. Moreover, this affection occurs most frequently in connection with a disordered stomach, and chronic dyspepsia is essentially a disease of adult life. As regards syphilis and scrofula, as

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[1] "Diseases of the Throat and Nose," Am. ed., 1880, vol. i., p. 31.

[2] "The Throat and its Diseases," London, 1887, p. 165.

[3] "Diseases of the Nose and Throat," Philadelphia, 1886, p. 250.

already stated, their manifestations will be considered under a different category.

The above writers do not, I think, sufficiently recognize the close connection between acute pharyngitis and acute inflammatory processes in the naso-pharynx or the nasal cavities proper, although Wendt[1] and Schech[2] give considerable prominence to this observation. When an acute pharyngitis occurs in connection with a cold in the head, it is not due to an extension of the disease from above, but rather to an obstruction of nasal respiration. If, however, it occurs in connection with an acute naso-pharyngitis, this must be regarded as the result of an extension of the morbid process, although undoubtedly the engorgement of the lymphatic tissues above, interfering with the return circulation of the blood-vessels from the parts below, necessarily leads to an acute engorgement of the lower area. Browne[3] seems to suggest that the use of alcohol, tobacco, highly seasoned foods, and hot drinks may excite an acute pharyngitis, his idea apparently being that their local action during deglutition is that of an irritant. The faucial mucous membrane is covered with dense pavement epithelium, and is so thoroughly inured to the impact of substances of various kinds in the act of deglutition that I doubt if it is in any degree susceptible to irritants in this process. Alcohol is very liable to excite gastric and hepatic disorders and a secondary chronic pharyngitis. Some suggest that the use of tobacco may prove a temporary irritant. That these articles ever excite an acute inflammation in this region, I think, is very doubtful. Highly seasoned food may act on the stomach, but not primarily on the pharynx. Hot drinks are usually taken without injury to the pharynx, as far as their local action is concerned; although at the boiling-point they may excite what is usually termed a traumatic pharyngitis, a subject which needs no special discussion. Cases have been recorded in which the most aggravated form of acute pharyngitis has been excited by the passage of boiling water, or by certain chemicals, such as, in the order, perhaps, of their frequency, oxalic acid, carbolic acid, caustic potash, strong ammonia, sulphuric acid, nitric acid, etc. In these cases, the acute gastritis is generally the serious feature of the trouble, the pharyngeal inflammation being somewhat secondary in importance, and, moreover, each case presents individual features, which must be treated according to the methods of general surgical procedure. The discussion of this subject, therefore, need not be entered upon here.

[1] "Ziemssen's Cyclopædia," American edition, 1886, vol. vii., p. 58.

[2] "Diseases of the Mouth, Throat, and Nose," English ed., Edinburgh, 1886, p. 95.

[3] Loc. cit.

The same also may be said of those cases in which an inflammatory process is the result of injuries, occasionally received by either cutting or blunt instruments. Cohen[1] states that an acute pharyngitis may result from an extension of stomatitis. I have never observed such a tendency, and I think it must be exceedingly limited, unless perhaps in the case of mercurial stomatitis, wherein we occasionally find the mucous membrane of the soft palate and pharynx notably softened and relaxed, although scarcely constituting a typical acute pharyngitis. Belladonna, as is well known, produces an hyperæmic condition of the blood-vessels of the soft palate and pharynx, and yet in this case the membrane has usually a dry and glassy appearance, while the hyperæmia is largely venous in character, giving it a darker tint than is observable in acute inflammation. Iodide of potassium, on the other hand, produces a condition of the pharynx which cannot easily be discriminated from an acute idiopathic inflammatory process. How this acts it is by no means easy to determine. I think it possible that its primary action is upon the stomach, and that the pharyngeal condition is secondary, and yet it undoubtedly has a specific action, in that the whole of the upper air tract, including the nasal passages, is usually affected by its use. A not unreasonable explanation of it might be that the drug, after it is absorbed into the circulation, is eliminated through the mucous membrane of the upper air tract, and in its escape acts as a local irritant thereto.

PATHOLOGY.—I know of no special investigations as to the morbid changes which take place in the membrane of the fauces in acute pharyngitis, and we can only say that, in general, the pathology of the disease is the same as that of an acute inflammation involving the mucous membrane of any portion of the upper air tract, bearing in mind, however, that in the pharynx the parts are lined with squamous epithelium, and are very sparsely endowed with gland structures; hence the prominent changes consist in a notable hyperæmia, and consequent thickening of the membrane involved, giving rise, in the first stage of the attack, to an arrest of all secretion, viz., the dry stage. This is followed by a moderate serous exosmosis, with perhaps some increase of mucous secretion, although this is at all times scanty. Wendt[2] states that, in the later stages, ulceration may occur. This, of course, is one of the incorrect observations of the early days of laryngology.

SYMPTOMATOLOGY.—The attack is ushered in with a feeling, perhaps, of general malaise or mild chilly sensations, although the disease is never of so grave a character as to give rise to a well-

[1] "Diseases of the Throat and Nasal Passages," Philadelphia, 1879, p. 85.

[2] Loc. cit., p. 59.

developed chill. Indeed, the general disturbances due to the pharyngitis itself are usually of a somewhat trivial character, although, if, the disease complicates an acute rhinitis, or, more especially, an acute naso-pharyngitis, we may have an attack accompanied by constitutional disturbances of a somewhat well-marked character, such as decidedly chilly sensations, considerable prostration, and a temperature running up to 101° and 102°, or even more. Accompanying the febrile movement, there may be pain in the bones, loss of appetite, and other evidences of systemic depression. In connection with this, the patient experiences a sensation of dryness and discomfort about the fauces, with what is usually described as a scratchy feeling in the throat. If deglutition is painful, this must be attributed to the somewhat unusual event of a notable swelling of the tonsils in connection with the pharyngeal disorder, or possibly this may be due, and often is due, to an accumulation of cheesy matter in some of the crypts of the tonsil, which gave rise to no discomfort until the region became the seat of an active hyperæmia. After twelve to twenty-four hours, the parts become moistened with serous or sero-mucous secretions, which are quite limited in extent, unless in those cases where the nose or naso-pharynx is involved, when the discharge becomes considerable in amount. In general, we may state that the subjective symptom of an acute idiopathic pharyngitis, as such, are not prominent, but usually, if much discomfort is experienced, it is due to an involvement of the nose or naso-pharynx. Cough is rarely, if ever, present, unless the larynx is also implicated in the idiopathic process. This is exceedingly liable to occur on the second or third day, the membrane of the larynx becoming the seat of a localized hyperæmia, rather than an inflammatory process, giving rise to a mild impairment of the voice, of which hoarseness is the prominent feature. The trachea may become also involved, in which case there is more or less secretion from these parts, which is expelled by the act of coughing. This, however, is rarely of a distressing character. As a rule, the larynx and trachea are not prominently affected, unless the nose and naso-pharynx are also invaded. Not infrequently the voice has a curious metallic ring to it, which is due to no recognizable morbid condition in the larynx, but may be explained on the theory that the terminal filaments of the pharyngeal plexus of nerves are subjected to a certain amount of pressure by the hyperæmic condition of the pharyngeal mucous membrane, and that these act reflexly on the motor innervation of the larynx. While, as before stated, there is usually no pain in deglutition, the pharyngeal mucous membrane becomes somewhat sensitive to the passage of

either coarse particles of food, or fluids above a moderate temperature. Cold, on the other hand, is rather grateful. The faucial and pharyngeal muscles are somewhat hampered in their action, as a result of the hyperæmia, although deglutition is usually accomplished without pain.

DIAGNOSIS.—An examination of the parts should be made with some little care, in that the morbid process renders this region exceedingly sensitive, and, in order to obtain a nice estimate as to the character and degree of the inflammatory action, the fauces should be inspected in a state of rest. The examination, then, is only accomplished by placing the spatula well back on the arch of the tongue and exercising a gentle pressure downward and forward, in order to avoid the involuntary contraction of muscles, or retching, which is liable to occur. If seen in a state of quietude, the whole mucous membrane including the pharynx, the pillars of the fauces, and the soft palate, and uvula, will be found to be the seat of a diffuse hyperæamia, which gives the membrane the characteristic bright reddish tinge of an active acute inflammation. This is the appearance seen in what we regard as an ordinary idiopathic pharyngitis, the result of a simple exposure to cold. The membrane is reddened and slightly swollen in appearance, although this is more in the appearance than in the actual condition, because, as we know, the pharyngeal mucous membrane is a hard, dense structure, with a somewhat limited blood supply, the hyperæmia being largely of a capillary character. In the soft palate and uvula, however, where we find tissues more highly vascular and of a less dense consistency, the swelling is more marked. Especially is this true of the uvula, which is apt to show considerable swelling, which takes on an œdematous form. This manifests itself especially in the tip and border of this appendage, which show the characteristic semi-translucence of œdema. In rare cases, we may find the uvula swollen to twice its normal size, or even more, the swelling being partially œdematous and partially due to the distended condition of the blood-vessels traversing the interior of the organ.

If the attack is purely of an idiopathic nature, and not dependent upon or accompanied by an inflammatory process in the naso-pharynx or in the nasal cavities, the secretion from the parts is exceedingly limited, in fact scarcely to be observed, the morbid process seeming to expend itself in the moderate amount of swelling and hyperæmia, with an accompanying general hyperæsthesia of the whole faucial region. The tonsils, also, are somewhat swollen, projecting from their bed between the pillars of the fauces, and present the same hyperæmic condition as the parts above

described, the extent of the swelling being dependent upon the amount of previously existing hypertrophy.

If the disease is secondary to, or an accompaniment of, an acute rhinitis or an acute naso-pharyngitis, we find the pharynx proper the seat of inflammatory changes already described. The soft palate and uvula, however, in this case, are involved to a much less extent, and oftentimes show no evidence of morbid action. When the disease is secondary, however, we find the pharynx covered with a more or less profuse secretion of semi-opaque mucus or muco-pus, which diffuses itself over the whole region, or may collect in the central channel. The source of this secretion, however, is in no case to be traced to the lining membrane of the lower pharynx, but is always poured out by the secreting structures of the naso-pharynx or the nasal cavity. Sajous[1] observes that in a majority of cases of acute pharyngitis, there is notable swelling of the mucous membrane on the upper surface of the soft palate. This, I think, however, only occurs, as Schech[2] has suggested, in connection with an inflammatory process in the naso-pharynx.

PROGNOSIS.—A simple idiopathic case of acute pharyngitis runs its course in from five to seven days. It involves no danger to life, or any serious impairment of the general health. The discomfort attending the progress of the disease is limited in extent, and is largely confined to the first and second days of the attack. If the disease occurs in connection with an acute rhinitis, the discomfort is more, and the attack may be somewhat prolonged. Where it is met with in connection with an acute naso-pharyngitis, its course is exceedingly uncertain, in that it may terminate at the end of a week, or it may persist for a month, or even six weeks.

We make the general statement that it is attended with no serious dangers. This statement should be made with a certain amount of reservation, especially in young children, for I think there can be no question that a mucous membrane in a state of acute inflammation furnishes a favorable nidus for the development of graver diseases, such as croup and diphtheria. This point I regard as an exceedingly important one, and one which will be discussed more elaborately further on, the idea being, however, that in many cases of an acute infectious disease, which are said to have had their onset with an exposure to cold and resulting sore throat, the materies morbi made its entrance into the system only after the acute inflammation of the mucous membrane had offered it a favoring foothold. This fact, I think, is of special importance with reference to young children, in connection with croup and diphtheria, which we all recognize as of specific origin, and yet, not

[1] Op. cit., p. 251.

[2] Op. cit., p. 95.

infrequently, an attack of croup appears to commence with an ordinary cold.

Laveran[1] reports a case in which œdema of the glottis, with fatal result, supervened upon an attack of acute pharyngitis. I do not think we are justified in regarding œdema of the glottis as one of the dangers of this disease, as it seems to me that in Laveran's case there is good ground for supposing either that the patient primarily was attacked with some graver disease than an ordinary acute inflammation of the pharynx, or else that the œdema was due to some other cause. In a similar case reported by Rühle,[2] in which a fatal œdema of the glottis supervened upon an acute pharyngitis, the patient was suffering from acute alcoholism, and it is a fair inference that the œdema was due to some morbid condition of the kidneys or liver resulting from his alcoholic habits, rather than to the acute pharyngitis.

Bamberger[3] reports a case of acute pharyngitis, without complications, which terminated fatally, to which Mackenzie[4] refers, expressing the opinion that it was a case of scarlatina, as he does also of the case reported by Rilliet and Barthez[5] of a child who died apparently from an acute pharyngitis. In this latter case, however, the post-mortem revealed the submucus tissues of the pharyngeal membrane infiltrated with pus, which would rather suggest that the disase was acute infectious phlegmon.

In view of the above instances, it is well to suggest that the parts should be examined with a certain degree of thoroughness in all cases of inflammation, whether catarrhal or otherwise, and the possibility borne in mind that an apparently simple catarrhal inflammation of this region may be the forerunner of a grave constitutional disorder, and hence it is not always wise, at the onset of the affection in young people, to give either a definite prognosis or a diagnosis.

Gubler[6] has reported an instance in which paralysis of the palate followed an acute pharyngitis. Mackenzie,[7] in referring to this case, seems to regard it as an instance in which paralysis followed an idiopathic inflammation, although Gubler, in his original report, undoubtedly considered it diphtheritic (angine couenneuse). That paralysis may follow an idiopathic inflammation, however, seems to have been established in a case reported by

[1] Bull. Gén. de Thérap., June 30th, 1876.
[2] Volkmann's Sammlung klin. Vortr. (Medicin), No. 6, p. 31.
[3] "Handbuch der Pathologie," etc., Erlangen, 1855, Abth. 1, p. 6.
[4] Op. cit., p. 32
[5] "Maladies des Enfants," Paris, 1855, vol. i., p. 233 *et seq.*
[6] Archives Gén. de Méd., 1860, vol. ii., p. 739.
[7] Op. cit., p. 32.

Broadbent,[1] although I am disposed to think that where such a sequela occurs it should, as a rule, be accepted as evidence that the inflammatory process has been probably of diphtheritic origin.

TREATMENT.—If the affection is dependent upon a morbid process in the nose or naso-pharynx, no treatment is of any avail, other than that directed to the mucous membrane of the air passages above. This must be carried out in the manner already fully given, in the chapters devoted to these diseases, in the previous volume. When, however, the disease consists of an acute inflammation only of the parts visible by oral inspection, much probably can be done in the way of applications made directly to the parts. The simplest method of making applications is by means of a gargle. This procedure, as ordinarily done, probably accomplishes very little good, in that patients do not allow fluids to come into contact thoroughly with the parts. The usual procedure is to take a mouthful of fluid, and, throwing the head back, allow the medicament to settle down upon the tongue and soft palate, when, by slow expiration, it is agitated in this region. In order to be of any service, a gargle should reach the pharygeal wall. I think this is always feasible if you simply direct the patient to let the fluid go as far as possible into the throat, without swallowing it. The gurgling sound which is usually made in this process is entirely unnecessary.

A favorite remedy for a gargle is chlorate of potash, and perhaps this is as good a remedy as any in these cases. It should be used in a strength of from five to ten grains to the ounce, the throat being gargled five or six times a day, according to the discomfort of the patient.

Among other salts which may be used with good effect may be enumerated the following:

Sodii boratis, 10 gr. to the oz.; sodii bicarb., 8 gr. to the oz.; aluminis, 5 gr. to the oz.; and tannin, 5 gr. to the oz. These may be used singly or in combination.

A favorite method of applying astringents to the throat is by means of a lozenge, made up with fruit paste or sugar, each lozenge containing a certain amount of an astringent or sedative, according to indications. It is many years now since I have prescribed lozenges in these cases, in that I regard their use as not only valueless in the accomplishmnet of any good, but objectionable on account of the method of their preparation. As before stated, the pharynx is in intimate sympathy with the stomach, and whether the stomach be notably deranged in an attack of acute pharyngitis, or not, it is, I think, in all cases, somewhat more sensitive than normal,

[1] Lancet, 1871, vol. i., p. 308.

and the nauseating sweets, of which these lozenges are composed, are ordinarily by no means agreeable to the patient. In those rare cases in which I have used medication in this form, I have preferred always that the drug should be incorporated in liquorice, which, even in its purity, is exceedingly agreeable to a patient suffering from this form of sore throat. For this purpose one of the following makes an excellent preparation:

℞ Potassii chloratis, ... gr. xv.
Ol. menth. pip., ... gtt. ij.
Ext. krameriæ, ... gr. xv.
Ext. glycyrrhizæ, ... ʒ iiss.
M. ft. massa in trochisci No. xxx. div.

Or,

℞ Ext. eucalypti, ... gr. xxx.
Sodii biboratis, ... gr. x.
Pulv. piment., ... gr. vij.
Ext. glycyrrhizæ, ... ʒ iiss.
M. ft. massa in trochisci No. xxx. div.

Cocaine, beyond any drug in the pharmacopœia, possesses the power of depleting the blood-vesesls. Directly applied in solution to the pharynx, as by the atomizer, it gives rise to rather unpleasant symptoms, and does no permanent good. Used in minute doses in the form of lozenges, however, it acts very agreeably, as in the following:

℞ Cocainæ muriatis, ... gr. v.
Ext. rhatany, ... gr. ij.
Sodii bicarb., ... gr. xv.
Ext. glycyrrhizæ, ... ʒ iiss.
M. ft. massa in trochisci No. xxx. div.

If the throat is irritable, with a disposition to cough, or the raw feeling is present, of which the patients so often complain, some sedative may be used. Of these I think preference should always be given to some of the milder drugs, rather than to opium or morphine, as in the following:

℞ Codeinæ, ... gr. v.
Ext. catechu, ... gr. xxx.
Ex. glycyrrhizæ, ... ʒ iiss.
M. ft. massa in trochisci No. xxx. div.

If there is much secretion, which becomes thick and is not easily expectorated, we may make use of a combination as follows:

℞ Ammonii muriat., ... gr. xxx.
Pulv. ipecac., ... gr. ij.
Pulv. capsici, ... gr. ss.
Ext. glycyrrhizæ, ... ʒ iiss.
M. ft. massa in trochisci No. xxx. div.

We have thus given a series of formulæ, to be made up in the form of lozenges, to carry out various indications in the treatment of acute pharyngitis. Of course, these ingredients may be interchanged in such manner as may seem best. If it seems desirable to administer these remedies in liquid form, any one of these prescriptions can be easily changed, with the suggestion that, in place of using a syrup or elixir, as has been so much the practice in past years, glycerin affords us a much more agreeable vehicle for the administration of these drugs, and, moreover, the beneficial local action of glycerin in these cases is thus secured.

Where the inflammation is not severe, I think that even simpler remedies than any of the above may be administered in an ordinary sore throat. I have not infrequently prescribed the use of marsh mallows, cream peppermint drops, glycerin tablets, or gum drops, horehound candy, pure rock candy, glycerin, lemon drops, and other simple confections of this sort, and I am confident that in many cases the comfort and welfare of the patient have been far better conserved than if I had administered a nauseating cough mixture.

Internal medication in this disease is not prominently indicated, and yet I think in all affections which are the result of an exposure to cold we must recognize a constitutional element. even if this is not evidenced by any marked elevation of temperature. Hence, in an ordinary catarrhal sore throat, the patient should be placed upon the use of from six to ten grains of quinine daily, given in divided doses, or, if this is not well tolerated, salicin may be given in from ten to fifteen grain doses three times daily. If the appetite is impaired, or there is any notable impairment of nutrition, these drugs may be combined with iron, as in the ordinary mixtures of iron, quinine, and strychnine. Aside from this, the indications for internal medication are limited to the use of some of the laxative mineral waters. These, I think, may be always used with benefit, without reference to any existing condition of torpid bowels, on the ground, already mentioned, of the intimate connection between the pharynx and digestive tract. For this purpose, the milder bitter waters should be used, such as Friedrichshall, Kissingen, Condal, Congress, or Hathorne. Failing these, a small dose of the Carlsbad salt, or citrate of magnesia, may be given.

It is rarely necessary to confine a patient to the house with a cold; indeed, I think, if the weather is not unfavorable, a brisk walk in the air is oftentimes beneficial. Nor, in taking outdoor exercise, is it necessary to make any elaborate and special preparation, in the way of extra clothing, muffling up the neck, etc. Such extra carefulness, I take it, rarely protects one from taking cold, but, on the contrary, enhances the danger of such an occurrence.

I doubt if external applications to the neck are of any avail in this trouble. The old-fashioned remedies of hot onions, flaxseed poultices, goose grease, pork rind, etc., increase the discomfort of the patient, rather than otherwise. In other words, counter irritation externally, probably has but trivial influence on the circulation of the blood in the pharyngeal mucous membrane. The old-fashioned red flannel round the neck for a sore throat is always objectionable. Cold and hot compresses have been much used in these cases. Practically, I think, they are much the same. A cold compress, if it remains a sufficient time bound about the neck, becomes so warmed by the heat of the body as to act as a fomentation unless frequently changed. Moreover, I question if any good is accomplished by them.

The above directions, it will be noticed, are all such as can be carried out by the patient. Of course, there are certain measures which a physician can carry out, either in his office or at the home of the patient, in the way of local applications. These, however, are not often indicated in acute pharyngitis; and, furthermore, the physician is not often called upon to carry out any course of treatment. Of course, when this is necessary, the indications are clear. The pharynx should be thoroughly cleansed, by means of the spray apparatus, using any simple cleansing wash, such as a five or ten grain solution of borax or soda, after which the inflamed membrane may be thoroughly medicated with one of the following, somewhat in the order of preference:

Glyceriti acidi tannici, . . .	ʒ i. to the oz.
Argent. nitratis, ...	gr. 10 to the oz.
Zinci sulpho-carbolat., . . .	gr. 5 to the oz.
Liquor. ferri perchloridi, . .	gtt. 10 to the oz.
Zinci sulphatis, ...	gr. 10 to the oz.
Cupri sulphatis, ...	gr. 3 to the oz.

These remedies, probably, will have a more active effect on the tissues of the soft palate and uvula than on those of the pharynx, although they should be applied equally over the whole of the mucous membrane of the fauces.

If the uvula is swollen and œdematous, it should be freely scar-

ified, letting out both blood and serum. If possible, the punctures should be made on the lower and posterior portion of the organ, although this is not always feasible. In addition to these, the patient should be directed to use freely small pellets of ice, held in the mouth, and allowed to rest against the swollen organ. This complication of pharyngitis is never a serious one, and I have seen no case which was not immediately reduced by puncturing.

There are two internal remedies which seem to have a somewhat specific action on the circulation of the blood in the fauces. These are belladonna and aconite. An acute pharyngitis is not ordinarily an affection of a sufficiently serious character to call for the administration of these drugs, and yet, where the disease is obstinate, their effect should always be tried. Of these, perhaps, the most active is aconite, which may be given, preferably, I think, in the form of the alkaloid, aconitia, in doses of $\frac{1}{400}$ of a grain to an adult, every two hours, until its constitutional effect is experienced in the formication of the fauces, and the numbness and tingling of the extremities. In administering belladonna, we give the tincture, with the idea that perhaps its local action in deglutition may add possibly to its beneficial effects, giving from three to five drops in a dessert-spoonful of water every two hours, until dryness of the fauces is produced.

It is an important duty, in these cases, to ascertain whether any complication exist in the nasal passages or in the naso-pharynx, and to carry out such indications as may appear, for the control of these affections. The measures above enumerated are for the treatment of symptoms as they present. In every case of inflammatory disease of the upper air passages which is the result of a cold, the effort should be made, if the case is seen early enough in its history, to abort it. This applies equally to an acute pharyngitis, an ordinary cold in the head, or to an acute naso-pharyngitis. It is unnecessary, however, here to repeat what has already been said, on the subject of taking cold, in the previous volume.

CHAPTER IV.

CHRONIC PHARYNGITIS.

By this term, it is intended to designate a chronic inflammation of the mucous membrane lining the oro-pharynx, of a purely catarrhal nature, namely, one in which the morbid process involves the mucosa proper, and not the glandular or lymphoid structures found in this region. In the chronic form of pharyngeal inflammation, I think it a rule that the inflammatory process confines itself almost exclusively to the pharyngeal mucous membrane; the soft palate, uvula, and pillars of the fauces not usually being involved in the morbid action, although, where the tonsils are in a state of even moderate hypertrophy, we not infrequently find, when the pharynx is the seat of chronic inflammation, that the tonsils are also to be found in a state of chronic hyperæmia and turgescence.

Etiology.—Chronic pharyngitis is in no instance the result of repeated attacks of acute inflammation of this region, but on the contrary the chronic process sets in first, whereupon its clinical history is marked by repeated attacks of acute catarrhal sore throat. Moreover, I think it is an exceedingly rare event to meet with a chronic pharyngitis as an uncomplicated idiopathic affection. Indeed, I am of the opinion that the disease is an exceedingly rare one, if we insist that its recognition shall be based on distinct evidences of morbid action in the mucous membrane lining the oro-pharynx. In the majority of instances it is dependent upon some form of chronic gastritis, evidencing what has frequently been insisted upon in previous pages, that the oro-pharynx really forms a part of the food tract, and not of the air tract, and that it is therefore in close and intimate sympathy, both pathologically and physiologically, with the digestive organs. The most frequent form of gastric disturbance which gives rise to a pharyngitis is undoubtedly that due to chronic alcoholism. It is occasionally stated that the pharyngitis is due to the habit of taking liquor undiluted. This is undoubtedly a mistake, as the pharyngitis does not occur until after the gastric disorder is fully established, as evidenced by the other symptoms, such as water brash, cardialgia,

etc. How far disease of the liver may give rise to pharyngitis is problematical, for although undoubtedly a pharyngitis may occur in connection with hepatic disorders, it is more probable that the local inflammatory process in the pharynx is due to the accompanying gastric disturbance, rather than directly to the hepatic disease.

We frequently meet with cases in which the use of tobacco gives rise to more or less distressing symptoms referable to the pharynx. In these cases I do not think that the tobacco excites the pharyngitis, but that its use aggravates and irritates the existing chronic inflammation. Here, the symptoms undoubtedly arise, not from the directly irritating quality of the tobacco smoke, which as a rule does not reach the pharynx, but rather to the fact that the nicotine absorption produces an unpleasant gastric disturbance, which reacts secondarily on the pharynx. Sota,[1] who has made something of a study of this question among the Latin races, who are said to use the strongest varieties of smoking-tobacco, takes the ground that the smoker's pharyngitis is due to the direct action of the smoke on the mucous membrane, establishing this view by the fact that a person merely sitting in a room charged with tobacco smoke will suffer, although not smoking himself. An analysis of tobacco smoke shows us that it contains nicotine, carbonate of ammonia, acetate of ammonia, empyreumatic acid, carbonaceous matter, moisture, and several juices. Passing over the latter as merely the result of the destruction of the woody fibre, we find that the essential elements of the smoke are the salts of ammonia and nicotine. The saline elements need not be considered. They are in a high state of dilution, and their action is but feeble. There remains, then, the nicotine, which, as is well known, is far more readily absorbed in the volatile than in the solid state. The conclusion is forced upon us that the nicotine absorption is the injurious element in the use of tobacco, and, as we know, the first action of this drug is upon the pneumo-gastric nerve, producing among its earliest effects a slight disturbance of the stomach, or even nausea and vomiting. I think, then, we are warranted in the statement that the use of tobacco may aggravate an existing pharyngitis, but can only produce it secondarily, by first giving rise to a gastric catarrh. While, then, I regard a chronic pharyngitis, in the very large majority of instances, as secondary to a gastric disorder, we occasionally meet with it, although perhaps rarely, in connection with a chronic naso-pharyngeal catarrh. In this case, it is due probably to the extension of the inflammatory process from the upper pharynx to the tissues below. This is

[1] Trans. Internat. Congress of Laryng., 1880, Milan, 1882, vol. i., p. 24.

aggravated to a certain extent by the fact that the naso-pharyngeal disorder is characterized by a profuse secretion of muco-pus, which is of a thick and tenacious character, and is expelled with considerable difficulty. Hence, the membrane of the lower pharynx is undoubtedly irritated by the efforts of the patient to dislodge the mucus by the constant hawking and expectorating, accompanied with the characteristic nasal screatus. That the secretions from the upper pharynx, pouring over the lower pharynx, in any way excite an inflammation I do not believe, as probably no secretion of the body is less irritating on account of its essential physical qualities than mucus, and it seems to me absolutely impossible that its mere presence, lying upon a mucous membrane, can excite an inflammation therein. While, therefore, a chronic pharyngitis may occasionally accompany a chronic naso-pharyngeal catarrh, it should be stated that this is a somewhat rare event, the morbid process in the naso-pharynx usually confining itself to this region, and, when diseased action in the passages below is caused by it, the morbid process usually passes over the oro-pharynx, to set up inflammatory changes in the larynx and the tissues beyond.

Another cause of the disease under consideration undoubtedly may be found in some obstructive lesion of the nasal cavity proper. The most frequent of these, undoubtedly, is an hypertrophic rhinitis. How this acts it is perhaps not easy to state, except on theoretical grounds, when we consider the rarity with which nasal disease gives rise to a pharyngitis. Probably, however, it is due to the nasal obstruction interfering with normal respiration, and compelling habitual mouth-breathing, this causing an abnormal dryness of the fauces, and secondarily irritation of the membrane lining the pharynx. This form of pharyngitis is usually of a somewhat mild character, and gives rise to no very notable symptoms referable to the faucial region.

We thus find that a chronic pharyngitis of catarrhal nature is really in itself a disease of no very great importance, occurring usually as a symptomatic affection.

PATHOLOGY.—The starting-point of this affection probably consists mainly of a general hyperæmia of the blood-vessels coursing through the membrane, followed by a moderate degree of hyper-nutrition, together with a slight excess of the normal amount of secretion. The hyper-nutrition, however, leads to no marked hypertrophy of the tissue, the morbid process expending itself largely in the engorgement of the blood-vessels, which becomes to an extent permanent or chronic. The membrane is thickened as the result of this hyperæmia, and also somewhat from a structural thickening of the mucosa proper, by the deposit of connective-

tissue cells in the deeper layers. The blind follicles or lymph structures are not involved. The muciparous glands are but few in number, in the normal state, and these undergo no notable changes.

SYMPTOMATOLOGY.—The symptoms to which a chronic pharyngitis gives rise are those due in the main to the disease on which the affection depends. If it occurs in connection with chronic gastritis, the pharynx is the seat of a constant sense of discomfort, with a feeling which the patient describes as one of rawness. There is no marked pain in swallowing, and yet highly seasoned foods or hot drinks pass the fauces with a certain amount of discomfort. If there is any marked excess of secretion, it is due to an accompanying naso-pharyngeal disorder, although there is a certain amount of secretion from the pharynx itself. The region is excessively irritable and intolerant of examination, this irritability being closely connected with the irritable stomach which is the frequent cause of the affection.

On rising in the morning, the patient usually passes some time in a vigorous effort at expelling the mucus from the fauces, the attempt not infrequently being attended by nausea and even vomiting. If the disease be attendant upon a naso-pharyngeal catarrh or an hypertrophic rhinitis, the symptoms referable to the pharynx are of trivial character, and in the main masked by the more serious affection of the region above.

DIAGNOSIS.—If the disease is dependent upon gastric disturbance, the membrane lining the lower pharynx will be found to be in a state of chronic inflammation, characterized by marked venous congestion, the inflammatory process usually being limited by the posterior pillars of the fauces, and rarely extending, in any degree, to the soft palate or uvula, although in aggravated cases these regions are involved in the morbid process. The color of the pharynx in these cases is characteristic, presenting a deep red, highly congested, beefy, raw-looking membrane, which resembles a chronic catarrhal inflammation of no other region. The surface is soft and velvety, and yet it presents an angry look. The examination, of course, should be made with exceeding great care, in that, the fauces being in such a highly irritable state, vomiting or retching is produced very easily. Indeed, this is very difficult to avoid.

In connection with this appearance, we will recognize something of the same look about the tongue, which is usually heavily furred, while the breath is of a sour, ill-smelling character, which at times is exceedingly offensive. Indeed, aside from the general appearance of the pharynx, the symptoms all point toward gastric disturbance.

If the disease is dependent upon disease of the naso-pharynx, we find the same congested appearance of the membrane, although in a much less degree than that above described, while the soft palate and uvula are more liable to be involved in the morbid action, the membrane being swollen, congested, and notably relaxed. In this condition, the mucous membrane is also freely coated with mucus, the source of which is in the glandular tissue of the naso-pharynx.

Where the disease is dependent upon an hypertrophic rhinitis, the membrane assumes a somewhat dryer and glazed aspect, while at the same time it presents evidence of chronic inflammation, in the notable condition of hyperæmia, together with slight tumefaction.

The recognition of a pharyngitis dependent upon diseases of the nose and naso-pharynx is of no great importance, in that it demands no treatment other than in the removal of the cause.

The recognition of a pharyngitis dependent upon gastric disturbance is of importance mainly from a symptomatic point of view, its importance being in the recognition of the fact that the pharyngitis is due to a gastric disorder, and is evidence of it. This is quite simple if we subject the appearances presented to the naked eye to the ordinary tests of the existence of an inflammatory process, and are convinced that the inflammation is of purely a catarrhal character, and one which is not dependent upon hypertrophy of the follicles of the pharynx, constituting what is usually designated as a chronic follicular pharyngitis. In this latter disease, the existing condition should be easily ascertained by the large rounded projections which mark the existence of hypertrophied lymphoid follicles.

TREATMENT.—While I have endeavored to make clear the fact that a chronic catarrhal pharyngitis is usually a secondary affection, it by no means follows that it requires no local treatment, for this I regard as of a certain amount of importance, although no topical applications can be of any avail until the active cause of the affection has been removed. If the disease is dependent upon a naso-pharyngeal catarrh or an obstructive lesion in the nose, the main indications for treatment are such as are directed to the cavities above. If the disease is dependent upon the use of tobacco, this habit must be interdicted. In what I have said before in regard to tobacco, it should be understood that, while I do not regard tobacco as directly causing a pharyngitis, the use of tobacco may be the source of a gastritis, and thus indirectly the cause of the pharyngeal disorder, and furthermore the gastritis, with its accompanying pharyngitis, may be caused by the tobacco; hence the only treatment in this case consists in the abandonment of its use.

It is not the province of this work to lay down any course of treatment for gastric catarrh. Accepting the pharyngitis as evidencing the existence of this, a course of treatment is imperative. The general rules which should govern this are familiar to all. The value of mineral waters in this affection cannot be overestimated. I know of no special value in any of them, and yet in my own practice I have not been accustomed to ring the changes on the long list which are at our command, but have contented myself with directing the patient to drink each morning a glass of any of the milder bitter waters, such as Kissingen, Kronthal, or Hathorne. If the bowels are constipated, and the mineral waters are not sufficiently active, I occasionally prescribe the following:

℞ Ext. colocynth comp., ... gr. viij.
Podophyl., ... gr. i.
M. fiant pil. No. vi. S. One every night when necessary.

It is hardly necessary to state that the use of alcohol must be absolutely interdicted. In addition to the above, local applications should be made at intervals of two or three days to the pharynx, of one of the following:

Argenti nitrat., . . . gr. 10 to 20 to the oz.
Zinci sulphatis, . . . gr. 10 to 20 to the oz.
Liq. ferri persulphatis, . . ℥ 10 to the oz.

The intimate sympathy between the pharynx and stomach is such that I am disposed to think that a diminution of the circulation in the one region, may have a tendency to control a morbid process in the other. This may be purely theoretical, but it certainly is a justification for the use of active local treatment in the pharyngeal region, although undoubtedly the most important part of the treatment consists in measures for the relief of the gastric disorder.

CHAPTER V.

CHRONIC FOLLICULAR PHARYNGITIS.

THIS disease belongs essentially to the pharyngeal mucous membrane proper, without in any notable degree involving the tissues of the soft palate or uvula. It consists of a chronic inflammation of the lining membrane of the pharynx, in which the activity of the morbid process expends itself in the follicles which are scattered throughout the deep layers of the membrane, giving rise, mainly, to certain hypertrophic changes. This, in itself, would not excite any notable symptoms, were it not for the fact, which is confirmed by repeated clinical observation, that this follicular hypertrophy seems, in some rather obscure way, to involve the peripheral nerves, as the result of which the pharyngeal membrane becomes not only abnormally sensitive and hyperæsthetic, but also the seat of certain painful symptoms of a neuralgic character.

ETIOLOGY.—The disease undoubtedly commences in the earlier years of life, when that peculiar tendency toward the development of morbid changes in the lymphatic structures, which has already been discussed in the chapter on Hypertrophy of the Pharyngeal Tonsil, is most active (see Vol. I., page 541). As we have already observed, in young children, when the structures which compose the pharyngeal tonsil are in a state of hypertrophy, there will be seen, scattered over the lower pharynx, a number of small, rounded nodules, which really constitutes a condition of chronic follicular inflammation. During the earlier years of life, however, these changes in the follicles give rise to no notable symptoms referable to the pharynx, the discomfort arising from the more extensive hypertrophy in the follicles of the upper pharynx, perhaps, being of a more serious character, masks, more or less completely, any symptoms which could be directly attributed to the follicular disease in the lower pharynx. I am disposed to think, however, that in early life a follicular hypertrophy in the lower pharynx is of such a character as that it causes practically no symptoms whatever. When a lymph follicle has become the seat of hypertrophic changes, these probably remain, to a certain extent, permanent, the adenoid disease of the upper pharynx undergoing a retrograde process, by

which a naso-pharyngeal catarrh is developed in adult life, while the follicular disease of the lower pharynx in child life results in a chronic follicular pharyngitis in adult life. In this latter case, the changes which the follicles undergo result ultimately in a condition in which the affection becomes the source of more or less discomfort to the patient. In other words, a follicular pharyngitis in a child is a disease of no especial clinical significance; in adult life it may become the source of no little annoyance.

Underlying the development of all these forms of hypertrophy of the lymphatic glands, including pharyngeal and faucial tonsils and pharyngeal follicles, we must recognize the presence of that curious condition which we call the lymphatic diathesis, which, while not constituting scrofula, is closely allied to it. Potain[1] very admirably states this, in the assertion that this tendency to the involvement of the lymphatic tissues in morbid processes, so characteristic of child life, is but a normal condition, which, carried one step further, gives us the true pathological condition of scrofula. Thus, we recognize the same general tendency in the hypertrophy of the pharyngeal follicles, and also in the enlargement of the lymphatic glands of the neck, and yet the clinical history of the two presents a markedly different picture. The only point of interest, however, to us, in the present connection, is in recognizing this relationship. If this view be accepted, we can easily understand how the development of the disease is encouraged by improper nutrition, living in a damp, unhealthy atmosphere, and by other hygienic surroundings of a vicious character, a point upon which special emphasis is laid by Herz.[2]

It is commonly asserted that hypertrophy of the glands of the oro-pharynx, as well as those of the faucial tonsils and naso-pharynx, may result from an attack of diphtheria, scarlet fever, measles, or other of the infectious diseases, which are accompanied by local manifestations in the fauces. This is probably true to a certain extent, although it is more plausible to state that these infectious diseases have stimulated an existing morbid process into renewed activity, rather than that they have caused them *ab initio;* and, moreover, these diseases, belonging to child life, it is a somewhat remote conclusion that they have been responsible for the disease under consideration, as it manifests itself in adult years.

A follicular pharyngitis is more frequently observed in women than in men, and yet, probably, it exists with equal frequency in either sex. The fact that we see it more frequently in women is easily explained, on the ground that the presence of these follicles

[1] Dict. Encyclop., Art. "Lymphatique."

[2] Wien. med. Wochenschr., 1881, vol. xxxi., pp. 989, 1,016.

make themselves felt more acutely, and give rise to more notable symptoms in individuals of a somewhat delicate constitution and nervous temperament.

Lizé[1] has found the disease frequently associated with certain skin affections, such as acne and eczema—an observation which is confirmed by Laségue[2] and Deel.[3]

This view, of course, is based purely on clinical observation, as we recognize no pathological connection between the disease under consideration and cutaneous eruptions.

Ikeler,[4] in asserting that the inhalation of a dust-laden atmosphere may give rise to the disease, but repeats an assertion which has been made numberless times before, with reference to inflammatory diseases of all portions of the upper air tract. That the inhalation of dust may produce temporary irritation of the air passages cannot be questioned; that it can produce permanent structural morbid changes in its lining membrane seems to me beyond possibility.

Kendal Franks[5] and Lennox Browne[6] are of the opinion that the follicular affection may develop from an ordinary catarrhal inflammation—a view which I do not indorse, as I believe that the two processes are practically distinct in their whole clinical history.

Skirving[7] has described what he calls an anæmic pharyngitis, in which a patient suffering from general anæmia experienced notably distressing symptoms, referable to the fauces, due apparently to a follicular pharyngitis. I think it scarcely possible that the anæmia caused the pharyngeal complication, but would rather suggest that the general depression of the vital powers acted in such a way as to bring into prominence the pharyngeal disease and render the local process more painful and distressing in character—a chain of events which not infrequently occurs in this connection, as observed by Sajous.[8]

In the same way, I think that any condition which impairs the general health, or interferes in any way with the normal functions, is liable to give rise to a sore throat where enlarged follicles exist, the general conditions causing the local disease to manifest more or less distressing symptoms, which are entirely in abeyance as long as the general health is good. Thus, while derangement

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[1] Union Médicale, Paris, 1851, p. 247.

[2] "Traité des Angines."

[3] Annal. des Mal. de l'Oreille, Paris, 1875, vol. i., p. 294.

[4] Transactions of the Michigan Medical Society, 1889, vol. xiii., p. 70.

[5] Dublin Journal of Medical Sciences, third series, vol. lxix., p. 381.

[6] "The Throat and its Diseases," second edition, London, 1887, p. 182.

[7] Australasian Medical Gazette, Sydney, 1877–78, vol. ii., p. 184.

[8] "Diseases of the Nose and Throat," Philadelphia, 1886, p. 256.

of the digestive apparatus, torpid liver, constipation, etc., are perhaps more active in the production of a catarrhal pharyngitis, their influence on the follicular form of the disease is not infrequently notable. This latter is a point on which Wolff[1] lays especial emphasis.

Many writers have asserted that the rheumatic and gouty diatheses, as well as syphilis, predispose to follicular pharyngitis. I think I have made clear my view, that enlargement of the lymphatic follicles is due, as a rule, to the existence of what we call the lymphatic temperament. I should go still further, and assert that I regard the existence of enlarged follicles as showing the presence of this diathesis, in a more or less active state. I therefore know of no relation, clinically or pathologically, between enlarged lymphatics and gout or rheumatism. As regards syphilis, its manifestations in the fauces are absolutely distinctive and characteristic, and belong to its own clinical history.

We repeat, then, our conclusion, that a chronic follicular pharyngitis is a local disease of the oro-pharynx, in which the follicles have undergone hypertrophic changes in early life, as the result, in the majority of instances, if not in all, of a peculiar habit, which we call the lymphatic diathesis; that these hypertrophic changes have remained, while the general dyscrasia, probably, has disappeared with the growth and development of later years. When these follicles make their presence felt in the pharynx, it is purely as a local disease, and, while the symptoms may be aggravated by the coexistence of a morbid process in the nose or naso-pharynx, I do not believe that the follicular disease occurs as the result of the morbid process in the passages above, as seems to be the view of Schech,[2] Wolff,[3] Seiler,[4] and others.

PATHOLOGY.—Up to comparatively recent times, the part played by the lymphatic structures in the morbid process seems to have been entirely overlooked. This is partly owing, perhaps, to the ignorance of the true anatomy of the mucous membrane, and partly to the somewhat vague and indefinite ideas prevailing as to the true function of the lymph follicles, or, as they were formerly termed, the ductless glands. In this manner, the view usually entertained in regard to follicular pharyngitis was that the morbid changes consisted in an hypertrophy of the muciparous glands.

Perhaps one of the earliest to differ from this view was Stoerk,[5]

[1] Monatschrift für Ohrenheilkunde, vol. xxxiii., p. 256.

[2] "Diseases of the Mouth, Throat, and Nose," English edition, Edinburgh, 1886, p. 102.

[3] Loc. cit., p. 256.

[4] "Diseases of the Nose and Throat," second edition, Philadelphia, 1889, p. 236.

[5] "Klinik der Krankheiten des Kehlkopfes," Stuttgart, 1876, p. 114.

who taught that the morbid change in this disease consisted of a local thickening of the epithelial elements of the membrane in isolated spots, as it were, thus constituting, practically, a warty growth.

That this teaching is erroneous need scarcely be stated. In the normal structure of the pharyngeal mucous membrane we find a large number of lymph follicles, distributed through the deep layers of the mucosa proper; while the muciparous glands are found to be comparatively few in number, being scattered somewhat irregularly over the central area of the oro-pharynx, while along each border, immediately behind the posterior palatine folds, we find them aggregated in large numbers.

That the small hypertrophied masses in follicular pharyngitis should have been considered as diseased muciparous glands is easily understood when we consider that these masses bear a close relation, both as to location and number, to the normal secreting glands, whereas the essential morbid process consists of changes in the lymphatic tissues. The reason of this is very clearly demonstrated by Sallfield,[1] who has shown us that the activity of the morbid process involves principally those lymphatic follicles which are grouped about the muciparous glands. According to this teaching, the morbid process consists of an increase of the normal lymph elements, which are found distributed not only about the extended portion of the follicle, but about its outlet. The greatest activity of the process, however, is expended in the lymph tissue which is deposited about the follicular duct. Now, we should naturally suppose that the result of this would be to produce a stenosis of the duct, with a resultant retention and subsequent degeneration of the secreted mucus. This, however, as we know, is not a feature of the clinical history of the disease. Sallfield explains this, on the ground that the deposit of lymph tissue about the duct acts in such a way as to draw outward upon the duct walls, rather than to press inward, thus creating an abnormally open-mouthed follicle. In connection with this lymphatic hyperplasia, there is also a certain amount of hypertrophy of the elements which go to make up the normal muciparous gland. This is, however, of such slight extent, as compared with the morbid changes in the lymphatic tissue, as that the diseased process in this latter may be considered as constituting the whole of the morbid activity. In certain instances we may find this lymphatic hyperplasia extending, either locally or diffusely, in the deeper layers of the mucous membrane, thus constituting, as we often see on ocular inspection of the parts, somewhat broad-

[1] Arch. für path. Anat., 1880, vol. lxxxii., 147.

ened placques, as it were, rising above the surface of the pharyngeal membrane, although, as a rule, the disease manifests itself in the small, rounded eminences usually seen on the wall of the pharynx. There is, also, probably, a certain amount of hyperplasia involving the whole area of lymphatic distribution in the deep layers of the mucous membrane, giving rise to a thickening of the whole structure, although this is not apparent, usually, on gross inspection. Robinson[1] states that the mucous membrane in this disease is frequently atrophic, on one side or the other, giving rise to a condition of asymmetry. He does not, however, tell us to what stage of the disease this phenomenon belongs. Kendal Franks,[2] on the other hand, is more clear, in asserting his belief that atrophy occurs in a certain number of cases, as a part of the clinical history of the disease, under which an ordinary inflammatory process ultimately develops atrophic changes, giving rise to what is described as pharyngitis sicca. I think both these writers somewhat in error, in that they fail to clearly comprehend the true clinical significance and history of lymphatic hyperplasias. I have already endeavored to make clear my understanding of this, viz., that the primary stage of the disease commences in child life, the morbid process being practically the same, whether it give rise to adenoid growths in the pharyngeal vault or to hypertrophy of the follicles of the lower pharynx. When this hyperplasia first occurs, the lymph follicles are large, rounded masses, of soft and yielding consistence. As years go on, they seem to undergo certain changes, which, while not probably constituting either true atrophy or sclerosis, are characterized by a marked diminution in size, with increased density. In certain cases, undoubtedly, they disappear of themselves, the lymph tissue being reabsorbed. In other cases they remain, constituting permanent morbid changes: when located in the vault of the pharynx, giving rise to a naso-pharyngeal catarrh; when located in the oro-pharynx, giving rise to a chronic follicular pharyngitis.

I think we may get something of an idea of this change, by comparing the two pathological plates shown in Volume I., Fig. 126, page 542, illustrating the hyperplastic masses of lymph tissue in hypertrophy of the pharynegeal tonsil; while in Fig. 123, page 523, we see these lymph masses thirty years later, now constituting the morbid process of a naso-pharyngeal catarrh. They undergo a retrograde movement, but, I think, it is a movement that belongs to the clinical history of the disease, and does not constitute a process of true atrophy, as suggested by Robinson and Franks.

[1] American Journal of Medical Sciences, Philadelphia, 1876, n. s., vol. clxi., pp. 84–91.
[2] Loc. cit., p. 387.

This latter belongs essentially to the mucosa proper, and perhaps it might be well to state here, never occurs, either in the simple catarrhal or the follicular form of inflammation of the lower pharynx.

Cohen [1] states that an ulcerative process occasionally occurs as part of the clinical history of this disease, as evidenced by small cheesy masses making their appearance at the orifices of the hypertrophied follicles. It is scarcely necessary to state that this does not in any possible way constitute ulceration, the accumulation of cheesy matter being a rare and adventitious feature of the disease, and, when present, giving rise to, perhaps, some localized irritation, but never to an ulcerative process.

We occasionally find, although somewhat rarely, the follicular disease complicated by a chronic catarrhal inflammation of the pharyngeal mucous membrane. In this case, however, the latter

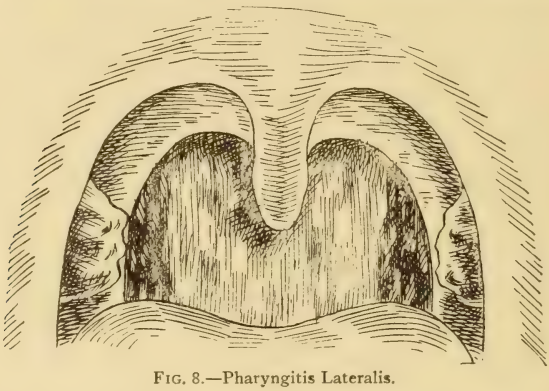

FIG. 8.—Pharyngitis Lateralis.

process bears no special relation to the follicular hyperplasia, nor do I think it is in any way dependent upon it, the one being, as we have already endeavored to make clear, dependent on disorders of the digestive apparatus, while the other is purely a local affection. As before intimated, we may find the diseased follicles showing themselves in minute, rounded eminences, scattered over the middle area of the oro-pharynx, or they may aggregate themselves on the sides of the pharynx, and immediately behind the posterior pillars of the fauces, constituting more or less prominent ridges in this region (see Fig. 8). To this form of the affection the term pharyngitis lateralis has been applied by Schmidt,[2] who has observed cases in which this ridge or chain of enlarged follicles extended as far down the pharyngeal wall as to the base of the epiglottis; while Hering [3] goes still further in his classification, and describes

[1] "Diseases of the Throat and Nasal Passages," N. Y., 1879.

[2] Deutsches Arch. f. klin. Med., Leipsic, 1880, vol. xxvi., pp. 421–424.

[3] Rev. mens. de Laryngol., etc., Bordeaux, 1882, vol. ii.

a pharyngitis lateralis hypertrophica, and a pharyngitis lateralis hyperplastica; restricting the former term to the disease described by Schmidt, in which the lymph follicles are involved, while the latter is used to designate a form of pharyngitis in which there seems to be a localized hypertrophy in the mucosa proper, forming a somewhat prominent ridge in one or both sides of the pharynx, immediately upon the plica salpingo-pharyngea. In well-marked cases of pharyngitis lateralis, we occasionally find the posterior pillar of the fauces adherent to the elevated ridge on the pharyngeal wall.

SYMPTOMATOLOGY.—As before stated, the presence of enlarged follicles in the pharynx, in child-life, is an exceedingly common occurrence, and yet it is at this period of life that they usually give rise to no symptoms whatever. When, however, they persist till adult life, and have undergone the retrograde changes outlined above, we find them giving rise to somewhat notable symptoms; indeed, the symptoms of this disease are far more marked and prominent than one would ordinarily suppose could be caused by what is apparently such an insignificant local lesion; and yet no region of the body, perhaps, is endowed with a higher degree of both motor and sensory innervation than the throat, being the site of so many and important functions, which require quick and ready muscular action, both of a voluntary and involuntary character, these being set in play and governed, through an unusually rich peripheral nerve distribution, through its lining membrane. We therefore find that any impairment of function or even slight morbid change in the throat is liable to be attended by symptoms which, although perhaps not distressing in character, become a source of exceeding great annoyance, being constant, persistent, and harassing.

It is a somewhat prevalent idea that the prominent symptom of a diseased process in the mucous membrane, in any portion of the air tract, is excessive secretion, with its resultant effort at dislodging and expelling the mucus or muco-pus poured out, by coughing, hawking, expectoration, etc., and, furthermore, that the morbid process in the throat usually gives rise to what, in common parlance, is called a sore throat. Thus, we find so prominent an authority as Cohen[1] describing, under chapter headings of Acute Sore Throat and Chronic Sore Throat, a number of different diseases, both of a constitutional and local inflammatory character. Most writers assert that hyper-secretion is a prominent symptom of the disease under consideration. Lennox Browne[2] goes so far as to state that there is not only an increased secretion of mucus and muco-pus, but also of saliva. I think that these observers must

[1] Op. cit., p. 179.

[2] Op. cit., p. 182.

have failed to recognize the fact that the disease of the lower pharynx was associated, as must not infrequently occur, with a chronic naso-pharyngeal catarrh, and, in discussing the symptoms of the former disease, have become confused, in attributing an increase of secretion to the follicular pharyngitis, whose real source was in the vault of the pharynx. Mackenzie,[1] on the other hand, states, more correctly, that the secretion is diminished. I am disposed to go still further, and say that hypersecretion is in no way a symptom of follicular pharyngitis; indeed, if we thoroughly understand the pathology of the disease, I think we are compelled to accept the view that there is nothing in the morbid changes which could in any way give rise to an increased secretion of either mucus or muco-pus. In those rare instances, in which the muciparous glands which the hypertrophied lymphoid tissues inclose are preserved or enlarged, mucus undoubtedly may accumulate within the crypt, and undergo cheesy degeneration. This is purely an adventitious occurrence, and in no way complicates the disease. These little masses of cheesy matter make their appearance in the mouth of the follicle, and are forced out usually in the act of deglutition.

Notwithstanding the assertion of Browne[2] and Mackenzie,[3] that pain is not a common symptom of follicular pharyngitis, I am disposed to regard this as by far the most constant and most prominent symptom which we meet with in this affection. The pain is usually of a dull, aching character, partaking somewhat of the nature of a neuralgic pain, referable to, and seeming to diffuse itself over the back of the throat, and yet, when the fauces are inspected and tested, we can often find a certain amount of tenderness in the enlarged follicles which is more than hyperæsthesia, thus apparently establishing the fact that this sensitiveness is due to a localized nerve condition. This symptom constitutes, to an extent, a constant source of annoyance, and yet varies in a marked degree at different times. This is mainly the result of functional exercise, or over-use of the muscles of the throat. Thus, for instance, while deglutition is not painful, the movement of the throat in deglutition seems to give rise afterward to an aggravation of the discomfort. In the same way, the excessive or prolonged use of the voice also seems to aggravate this symptom. It is by no means easy to explain why a follicular pharyngitis should give rise to this localized pain, unless we venture the theory that the terminal filaments of the sensitive nerves, which are so richly distributed in the pharyngeal mucous membrane, become involved, to some extent, in the

[1] "Diseases of the Throat and Nose," American edition, Philadelphia, 1880, vol. i., p. 48.

[2] Op. cit., p. 181.

[3] Op. cit., p. 47.

hyperplastic process which invades the lymphatic tissue. Now, while the lymph nodules are large and soft in consistency, as in early life, of course any involvement of nerve filaments would not necessarily cause discomfort. When, however, they have undergone the retrograde changes above described, by which they become reduced to one-third or one-fourth their original size, it seems not altogether improbable that the terminal filaments become subjected to a certain amount of pressure, which is, to an extent, constant. This is aggravated by the pressure of the bolus of food in deglutition, the movements of the throat in phonation, etc. This pain is referable to the whole of the pharynx, but we must bear in mind, that while the separate follicles are the seat of the most marked hyperplastic changes, there is a certain amount of diffuse lymph tissue throughout the whole of the mucosa proper. In addition to this, there is an undoubted addition to the amount of blood circulating, not only in the mucous membrane, but in the diseased follicles. Hence, this varying condition of blood pressure will account for the neuralgic symptoms, to which the disease gives rise; indeed, Robinson[1] attributes the pain, which he recognizes as symptomatic of this disease, to the blood pressure.

It sometimes seems as though there was a certain neurotic element in the disease, in that we often notice that individuals of a delicate constitution, and especially women of nervous and hysterical temperament, suffer far more severely with this affection than those in a vigorous state of health. This, however, would be more naturally explained in the fact, which we all recognize, that the general health reacts in a notable degree upon all affections of a neuralgic character. It follows, therefore, that follicular pharyngitis is more frequently observed in women than in men, simply because its symptoms are more marked, and they are more liable to seek relief at the hands of a physician.

Most writers mention hoarseness as indicative of follicular disease of the pharynx. Now hoarseness is usually an accompaniment of catarrhal inflammation of the larynx, whereas this affection does not, I think, in any case give rise to any extension of the catarrhal process into the air passages below. The vocal weakness, I think, is really to be considered an impairment of muscular action in the larynx, due to a reflex disturbance acting through the pharyngeal plexus of the sympathetic, and thence upon the motor innervation of the laryngeal muscles. In this way the voice, while apparently preserving its tone, seems to weaken and break down under any unusual or prolonged use, and especially in the nicer manipulation of tones of the singing voice.

[1] Loc. cit.

In the same way the muscles of the pharynx are slightly hampered in their action, so that deglutition, while perhaps not especially difficult, is not accomplished with perfect ease and facility, the act also being accompanied with some little discomfort, owing to direct pressure on the diseased tissues. This is particularly true in that form of the disease in which the lateral masses of glands are involved, the so-called pharyngitis lateralis. Maire[1] goes so far as to state, that the muscular structures of the œsophagus also may become impaired, thus hampering the act of deglutition in this region. He mentions this as an evidence of extension of disease, although recognizing its reflex character. In either case such apparent extension is exceedingly rare.

Cough usually accompanies the disease, and was recognized as early as the time of Dechambre.[2] This, however, is not of very distressing character, and partakes more of the nature of a nervous cough, being unattended with expectoration. A peculiar feature of all cases of follicular pharyngitis lies in the fact that the symptoms are variable and somewhat fickle in their persistence, being almost totally absent on occasions, while at other times the affection gives rise to very marked local disturbances. This is to be attributed to the neurotic element in the disease, under which the general physical condition of the patient in a notable degree affects the local symptoms. Weather and climate seem to have little influence except so far as they affect the general health. Liability to cold, or acute exacerbations is not usually observed, nor does this affection appear to bear any close relationship to simple catarrhal inflammations, involving the upper air passages. It is more frequently met with in perhaps the lower walks of life, in that poor hygienic surroundings, improper clothing, illy ventilated apartments, improper and insufficient food, all have a tendency to develop that peculiar condition under which the lymph structures take on that morbid activity, which, as Potain has already shown us, is so closely allied to scrofula.

DIAGNOSIS.—I am disposed to think that there has been no little carelessness exercised by physicians in their examinations of those portions of the fauces which are seen on direct inspection, due, perhaps, partly to the fact that the examination is so frequently made without the use of proper illumination. I do not think that this examination should ever be made without the use of the concave reflecting mirror. When this is used, and the parts are inspected carefully and in a state of entire relaxation, the diagnosis becomes a matter of exceeding simplicity. The mucous membrane of the

[1] Detroit Lancet, 1884, n. s., vol. vii., p. 361.

[2] Gaz. Méd. de Paris, 3d series, vol. vi., p. 461.

oro-pharynx will be seen to present the pinkish-white tint of an ordinary healthy mucous membrane, while scattered about over its surface, and projecting from it, will be observed a number of bright red masses of a rounded contour and shining aspect, which constitute the diseased follicles, standing forth in marked contrast with the normal mucous membrane upon which they rest, this latter even having the appearance of a paler tint, approaching an anæmic look, as the result of this contrast. The masses are usually about the size and shape of a bird-shot. Sometimes we have one or two grouped together, or we may have the somewhat broadened plaques already alluded to above, these occasionally attaining the size of a split pea. Where the lateral masses of lymph follicles are involved, constituting pharyngitis lateralis, we see extending down from beneath the velum, on one or both sides as the case may be, the elevated ridges, commencing above with a breadth of perhaps one-quarter of an inch, usually showing a tendency to narrow as they extend downward, and terminating in a somewhat pointed manner in the lower portion of the oro-pharynx. When the disease is uncomplicated with a catarrhal pharyngitis, a mistake in diagnosis is almost impossible. In those rare instances, however, in which this complication does occur, the diseased follicles present no contrast in color to the inflamed mucous membrane; hence the diagnosis will depend simply on the contour of the pharynx, and the recognition of the fact that we have these rounded masses projecting from above the surface of the adjacent parts. Practically, the only departure from the normal appearance is in the existence of these enlarged masses. There is no secretion either of mucus or muco-pus observed on the surface of the membrane, and if this be present it must be accepted as evidence of a diseased condition in the parts above, either of the nasal cavity or naso-pharynx. In this view I find few writers concurring, and yet that it is correct I think there can be no question, when we consider that the mucous membrane lining the oro-pharynx cannot be the source of any excessive secretion except when a state of catarrhal inflammation exists. Certainly this hyper-secretion cannot have its source in the diseased follicles, nor in the mucosa proper which is usually in a state of health.

Occasionally there will be observed, coursing across and through the superficial portion of the mucous membrane of the oro-pharynx, partially enlarged veins. This condition is met with more particularly in connection with follicular pharyngitis than with any other affection. When these enlarged veins are present in the pharynx, they are not infrequently seen at the same time in the soft palate and uvula. They were at one time regarded as possess-

ing a certain amount of clinical significance, in evidencing an inflammatory process. That their significance has been much overestimated I do not question. I have frequently seen them in otherwise perfectly healthy throats, where no faucial symptoms could be traced to their existence.

The tonsils are usually found somewhat enlarged, perhaps to the extent of projecting beyond the pillars of the fauces, although this has no special bearing on the disease of the pharynx other than that the morbid activity which gives rise to one condition is identical in all its clinical aspects with that which gives rise to the other. Those masses of lymph follicles which are found extending into and filling up the glosso-epiglottic fossæ, and which are usually designated as the lingual tonsil, bear the same relation to follicular pharyngitis clinically and perhaps pathologically as do the faucial tonsils, and are not infrequently found to be the seat of hypertrophic changes in connection with it.

The uvula is occasionally found elongated, in such a way as to apparently be an accompaniment of the follicular disease of the pharynx, this elongation being in the nature of an extension of the normal tissues, the organ not being notably inflamed. This, I think, is more apt to be the case when the pharyngeal disease is complicated with naso-pharyngeal catarrh, when the constant efforts of hawking, expectoration, and deglutition will have a tendency to drag down the uvula, as it were, from its normal support.

PROGNOSIS.—The disease is essentially a chronic one, for, as we have already discovered, it only develops its troublesome symptoms after a period of from ten to twenty years or even longer. When, however, the follicles have undergone those changes, the result of which is the development of distressing symptoms, they are apt to be somewhat persistent and may be a source of annoyance to the patient for many years. The course of the disease, however, involves no grave tendencies, either immediate or late. It gives rise to no changes of any sort in the air passages beyond, and leads to the development in them of no further condition than the one already established. It is practically a local disease at its outset, and remains a local disease during its whole existence. Krishaber,[1] Mackenzie,[2] Davis,[3] and others seem to think that the larynx may be invaded by the same morbid process, apparently by extension. I am confident that the area of distribution of the disease is established in the first morbid process of the lymph follicles in childhood, and that no genuine extension is possible in adult life.

[1] Annal. des Mal. de l'Oreille, 1880, vol. vi., p. 63.

[2] Op. cit., p. 48.

[3] Buffalo Med. and Surgical Journ., 1879, vol. xviii., p. 302.

Furthermore, I have never seen anything in the laryngeal mucous membrane which warranted me in making a diagnosis of true follicular disease in that region. We also find many writers, such as Franks[1] Mackenzie,[2] and Sajous,[3] stating that the disease may extend to the naso-pharynx. We undoubtedly find a naso-pharyngeal catarrh complicating this affection, but the primary morbid impulse in both diseases commences in early life, and hence that one or the other is a result of an extension of the morbid process I think cannot be accepted.

The suggestion, first broached by Horace Green[4] and indorsed by Ikeler,[5] that the disease may lead ultimately to phthisis, we refer to simply as a curious clinical observation, in that there can be no connection, either direct or indirect, between the two affections.

What the ultimate history of these follicles is, it is not easy to determine. Probably the same retrograde movement, which we have already described, constituting a process resembling atrophy, continues until they disappear or cease to give rise to any symptoms. Their usual history extends through the whole period of middle life. They exist in child life, without causing any annoyance. They become exceedingly small in the late years of life, when also they seem not to cause any disturbance. Their clinical history, then, extends probably over a period of twenty-five or thirty years. We consider the changes in these follicles as constituting a sort of shrinking, verging on atrophy, and yet I do not think the process is one of true atrophy or sclerosis, although it is frequently stated that atrophy of the pharyngeal mucous membrane characterizes the later stages of the disease. Robinson,[6] in indorsing this view, sustains it by the observation that we not infrequently see a unilateral atrophy as the result of which one side of the pharyngeal mucous membrane is less prominent than the other, constituting a state of asymmetry. I am disposed to think that Robinson has mistaken for atrophy a somewhat curious condition, which is by no means infrequently observed, in which the bodies of the vertebræ project into the pharynx somewhat to one side, a slight curvature of the spine, perhaps, giving rise to a lack of symmetry of contour in the pharynx, and yet without constituting in any degree a morbid condition. Possibly there may be cases in which this lack of symmetry is due to an irregular development of the muscles which underlie the mucous membrane. Certainly the condition is not infrequent, but it is to be regarded as merely a curious and unimportant anomaly.

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[1] Loc. cit. [2] Op. cit. [3] Op. cit., p. 258.

[4] "Treatise on Diseases of the Air Passages," N. Y., 1846.

[5] Loc. cit. [6] Loc. cit.

TREATMENT.—We have consumed a considerable space in the discussion of this disease mainly with the design of making clear much that I regard as vague and indefinite in the literature of the subject, and with the endeavor to establish a clear understanding of just what a follicular pharyngitis is, and what its clinical significance and tendencies are. While the disease itself is of somewhat trifling importance, I believe its recognition and definite diagnosis is of no small moment. Fortunately the treatment of it is exceedingly simple, and consists in the complete destruction or eradication of the diseased tissue. I regard this as an almost universal rule in regard to these diseased lymph structures, whether in the faucial, pharyngeal, or lingual tonsils, or in the enlarged follicles of the pharynx, this latter constituting a disease in which the lymphatic hyperplasia manifests itself in the smallest and most easily managed masses for destruction. That measure which accomplishes this destruction with the least injury to surrounding healthy tissues is the one which will commend itself most favorably to our consideration. For this purpose we may use chemical agents, the actual cautery, or the galvano-cautery. Of these, the chemical agents are objectionable, in that their action is feeble, and cannot well be circumscribed. Mackenzie[1] gives preference to London paste, Chomel[2] and Cohen[3] to nitrate of silver, Reed[4] and Franks[5] to carbolic acid. Lennox Browne,[6] Krishaber,[7] Koch,[8] Michel,[9] and Schmidt,[10] however, prefer the use of the galvano-cautery. Reed, in applying his carbolic acid, first cuts into the mass with a knife, while Ruault makes use of the compound tincture of iodine, after first cleansing and anæsthetizing the membrane.

The clinical indications here are perfectly clear, namely, to destroy the follicle, and furthermore its accomplishment seems an exceedingly easy matter. I do not believe cutting or curetting, as recommended by Stoerk,[12] is ever necessary. Their destruction by the actual cautery seems the easiest and most feasible plan. If the galvano-cautery is used, an exceedingly slender electrode should be employed, for the rounded follicles; and for the masses in pharyngitis lateralis, the knife or larger electrode is admissible. Where the galvano-cautery is not available, I find an equally efficient method to lie in the use of small iron wires, about the size of

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[1] Op. cit., p. 51.
[2] Gaz. des Hôp., 1848, 2 s., vol. x., p. 251.
[3] Op. cit., pp. 193–5.
[4] Columbus Med. Journ., 1887, vol. vi., p. 51.
[5] Loc. cit.
[6] Op. cit., p. 184.
[7] Loc. cit.
[8] Annal. des Mal. de l'Oreille, 1880, vol. vi., p. 273.
[9] Deut. Ztschr. f. Chir., Leipsic, 1873, vol. ii., pp. 154–164.
[10] Loc. cit.
[11] Arch. de Laryngologie, 1889, vol. ii., p. 190.
[12] Pitha and Billroth's "Handbuch der allgemeinen und speciellen Chirurgie," Stuttgart, 1876, vol. iii.

a knitting-needle, fitted into a simple form of handle. The ends of the wires are heated to a dull red heat in an ordinary spirit lamp, and plunged directly into the diseased mass, a pointed wire being used for the small masses, and broad conical or flat wires for the larger masses. In this manner, the whole of the enlarged follicle is completely destroyed, leaving on the surface a slough, which remains in the pharynx for three to five days. The result of this treatment, or indeed any treatment, is a somewhat painful sore throat, lasting for a day or so. This is usually, however, of a trivial character. Of course in a pharyngitis lateralis the destruction of tissue is much more extensive, and hence the inflammatory reaction is of a more severe type. Ordinarily, however, this is not a source of very much trouble, although in nervous and hysterical women, in whom this disease usually demands treatment, the discomfort attendant upon this procedure is liable to give rise to a considerable degree of constitutional disturbance. As a rule, it is perfectly feasible at a single sitting to accomplish the destruction of all the follicles which present, although it is well to go over the pharynx at intervals of a week, until ocular inspection shows them to have been completely eradicated. Of late years, I have been accustomed, in place of employing the wires just described, to make use of the little instrument shown in Fig. 71, Vol. I. The point of this is much smaller than the wires mentioned above, and, when heated to a red heat, can easily be made to pass directly through the whole mass of the enlarged follicle, and indeed through the whole thickness of the mucous membrane. If necessary, if the follicle is large, or if it is a broadened plaque, a number of these punctures may be made. The result of this is the complete destruction of the follicle, while at the same time the inflammatory reaction is reduced to a minimum. While this latter procedure does not always accomplish the destruction as rapidly as the larger wires, I think in many cases its use will be preferred, owing to the fact of its causing so little disturbance, in the way of a painful sore throat, after the operation. Shurley has devised a cautery instrument for these follices, in which the tip is composed of an amalgam, its special virtue consisting in that it retains heat much longer than a simple metal. This, however, is not a matter of great importance, as the manipulation is so quickly accomplished that any metal wire retains the heat a sufficient length of time to complete the operation successfully. Lennox Browne[1] attaches a certain amount of importance to destroying the blood-vessels which are seen coursing in the superficial tissues of the pharyngeal membrane, thus cut-

[1] Loc. cit.

ting off the blood supply from these masses. The difficulty about this, of course, is that we lack evidence to show that these blood-vessels, which are visible in the pharyngeal membrane, are the nutrient vessels of the follicles, and, furthermore, the destruction of the tumor itself is quite as easy, and a much more prompt and direct method of eradicating the disease. In addition to the mere destruction of tissue, I think in many cases certain general measures for the correction of the constitutional habit are indicated. These consist in the administration of general tonics, such as barks and iron, strychnia, etc., together with cod-liver oil, hypophosphites, etc. These measures, however, will be carried out according to such clinical indications as appeal to the ready intelligence of every practitioner. Thrasher[1] seems to find certain specific virtues in the use of iodide of potassium, while Cadier,[2] Franks,[3] Browne,[4] and others advise the administration of certain mineral waters. I question if any good is accomplished by the use of iodide of potassium, while the administration of the mineral waters, if resorted to, must be based on such clinical indications as present, other than those directly traceable to the enlarged pharyngeal follicles. Beverley,[5] regarding the disease as an anæmic condition of the nerve centres, makes use of the continuous current of electricity, one pole being applied over the spine, while the other is laid upon the tongue. This certainly is trenching somewhat on the domain of speculation, for, from a practical point of view, as before stated, the disease is purely local, and in carrying out the local measures above described, in the very large majority of cases, we will have carried out every clinical indication. As regards the treatment of any complicating disorders, such as chronic catarrhal pharyngitis, naso-pharyngeal catarrh, or any diseased condition of the nasal cavity, this is based on the existence of these disorders, as they bear no immediate relation to the pharyngeal disease, and their treatment is not necessary in eradicating it. Of course, if they exist, they should be treated, but entirely as independent diseases. It has been a somewhat standing practice among specialists to interdict the use of both tobacco and alcohol, in all forms of catarrhal diseases of the upper air passages. I am disposed to think that this is scarcely called for, for while in many instances it is undoubtedly necessary, in others I am quite positive that it is based on no clear indications, and may even be harmful, where one has been addicted to the use of one or the other, to make so sudden and great a

[1] Cincinnati Lancet and Clinic, 1884, n. s., vol. xiii., p. 69.
[2] Annal. des Mal. de l'Oreille, 1884, vol. x., p. 162.
[3] Loc. cit.
[4] Op. cit.
[5] Ohio Med. and Surg. Journ., 1887, vol. ii., pp. 412–417.

change as to absolutely shut down on the practice. In the disease under consideration, I seriously question if the use of alcohol has any effect in one way or the other, unless we have a complicating pharyngitis or stomach disturbance, and even in this case I think the influence of the habit is not marked. The use of tobacco, on the other hand, seems to have a notable influence on those affections of the upper air passages which are characterized by lymphatic hyperplasia, such as enlarged tonsils and naso-pharyngeal catarrh, as well as follicular disease of the pharynx. While, then, a patient is under treatment, I think it wise to either entirely interdict or greatly curtail the use of tobacco until a cure is completed. After this has been accomplished, of course the habit may be resumed with impunity, for certainly, while the use of tobacco may aggravate an existing follicular pharyngitis, it can in no way produce it *ab initio*.

CHAPTER VI.

ACUTE INFECTIOUS PHLEGMON OF THE PHARYNX.

THIS is a name given by Senator to a somewhat curious and usually fatal disease, in which the prominent local manifestation, at the onset of the affection, consists in a phlegmonous inflammation, which, commencing usually on one side of the oro-pharynx, extends, in a somewhat modified degree, both through the food and the air passages beyond. It is an exceedingly grave affection, in that it terminates in death at the end of from five to ten days. As affording us, perhaps, a more graphic picture of the progress of the disease, the following history is given of the first case reported by Senator:[1] The patient was a male, thirty-six years of age, who had never suffered from any severe illness. Fourteen days before his present illness, he had complained of hoarseness, lasting for one or two days. This disappeared under the use of simple remedies. Five days before he came under observation he had become overheated, and had taken a glass of beer, after which he immediately perceived a severe pain in the throat with difficulty in deglutition. Soon after, the voice became hoarse. There were no chills. An examination showed the patient to be powerfully built and well nourished. The whole region of the neck was swollen and painful to pressure, especially on the left side. Distinct glandular enlargement could not be made out. The mucous membrane of the fauces and tonsils was markedly reddened. A rhinoscopic examination was not practicable. There was no exudation in the fauces. Physical examination revealed no pathological condition in the thoracic or abdominal viscera. The temperature in the axilla was $103\frac{6}{10}°$. The pulse was very frequent. The respiration was greatly obstructed. The patient passed a quiet night under the use of morphine, and in the morning the dyspnœa and dysphagia were considerably ameliorated. The mucous membrane of the fauces was still markedly reddened. Pressure on the left tonsil was painful. The urine contained a large amount of albumin. Delirium, which had been slightly noticeable on the first day, now became a

[1] Berl. klin. Woch., 1888, vol. xxv., p. 77.

somewhat grave symptom, while the temperature went down to $100\frac{4}{10}°$. On the following night, the delirium became still more marked, and death soon followed, occurring somewhat abruptly. An autopsy revealed swelling of the mucous membrane of the fauces, with purulent infiltration of the submucous tissue of the left side of the pharynx, following the course of the great vessels as far down as the thorax. The epiglottis and vocal bands were œdematous. On the left side, there was observable a small decubital ulcer. The lymphatic glands of the neck, on both sides, were enlarged and reddened. The mucous membrane of the œsophagus was smooth. The mucous membrane of the stomach was reddened, thickened, and hemorrhagic, this swelling extending somewhat into the duodenum. The heart and pleura were normal. Both lungs were emphysematous, and the spleen, liver, and kidneys somewhat enlarged.

In addition to the above, Senator[1] reports another case, which came under his observation a month later; while, in addition to these, he recalled two similar cases which had occurred in his practice, one in 1876 and another in 1883, which he regarded as identical, although at that time the diagnosis of infectious phlegmon was not made. Senator includes, also, in his paper, a case reported by Cruveilhier.[2] In this latter case, the pharyneal symptoms developed into a typical gangrenous process, with sloughing of the pharyngeal walls, death occurring on the sixth day. The existence of the gangrene would seem to suggest a doubt as to the correctness of Senator's opinion in regarding it as a case of infectious phlegmon.

Still other cases of the disease have been reported by Parisot[3] and Carrington.[4] Parisot describes his case as one of gangrene of the pharynx and larynx, while Carrington reports his as phlegmonous pharyngitis. A careful reading of the cases, however, leaves little question but that they were instances of the acute infectious phlegmon described by Senator.

Still further instances of the disease have been reported by Landgraf,[5] Hager,[6] Baruch,[7] and Hewish.[8]

In reading the history of a case reported by Bartholow,[9] some time since, the suggestion occurs to us that it may possibly

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[1] Loc. cit. [2] "Anatomie path. du Corps humain," vol. i., fol. 5, pl. ii., fig. 1.

[3] Gaz. des Hôpitaux, Paris, 1860, vol. xxxiii., p. 107.

[4] Transactions Clinical Society of London, 1885, vol. xviii., p. 164, case 1.

[5] Berl. klin. Woch., 1888, vol. xxv., p. 97.

[6] Berl. klin. Woch., 1888, vol. xxv., p. 235.

[7] Berl. klin. Woch., 1888, vol. xxv., p. 256.

[8] Medical News, Philadelphia, 1888, vol. liii., p. 264.

[9] Cincinnati Medical Repertory, 1870 vol. iii., pp. 234–240 and 276–283.

have been an instance of infectious phlegmon, although he regards it as one of phlegmonous pharyngitis, followed by sudden death, at the end of a few days, from œdema of the glottis. Metzner[1] reports as "mycotic inflammation of the tonsils" a case the history of which, together with the autopsy, leave little doubt that it was one of acute infectious phlegmon of the pharynx. In this case there was an effusion (not purulent) into both pleural cavities—with purulent infiltration of the anterior and posterior mediastina.

We thus find our knowledge of this disease must be based on, practically, eleven cases, not including, of course, this one of Bartholow's, and leaving out of consideration the somewhat doubtful case of Cruveilhier's.

ETIOLOGY.—The somewhat curious clinical history of this malady seems to have impressed upon Senator the idea of its infectious character; hence he early instituted a search for some bacillus which might belong to it. His investigations, however, failed to determine the existence of any other than a bacillus very similar to the Staphylococcus albus. These investigations were made for Senator by Langerhans and Koch, who explored not only the local tissues in the pharynx, but also some of the abdominal organs. Israel, also, made a similar bacteriological study in Landgraf's case, with the result of discovering small numbers of the streptococcus. Inoculation and culture experiments were also tried in this same line of investigation, with apparently no result.

The study of the bacillus of this disease, therefore, so far, affords no special light on the subject of its causation.

We accept, then, its clinical history as evidencing the fact that it is due to a blood-poison of a virulent character, the source of which must be, for the present, regarded as somewhat speculative. That it is an entirely distinct affection from erysipelas must be accepted, on the ground not only of its clinical history, but in the absence of any evidence of a contagious source of the disease, this being wanting in every instance, with the exception of Baruch's case, where there might have been a possible source of contagion. The failure, however, of Israel or Koch to discover Fehleisen's erysipelas coccus must be accepted as a conclusive proof of the non-identity of the two diseases.

In one or two instances, notably Senator's first two cases, as also in Landgraf's, there may possibly have been a local cause for the affection, in the form of a mild traumatism. Thus, in Senator's first case the attack seemed to come on almost immediately upon taking a glass of cold beer, when overheated, while in Landgraf's it followed soon after the deglutition of a somewhat large bolus

[1] Berlin. klin. Woch., 1889, vol. xxvi., p. 653.

of food. We thus have suggested, perhaps, an analogy between this affection and that rare malady, phlegmonous gastritis, which, as we know, arises from apparently trivial exciting causes.

The disease belongs to adult life, all the cases reported occurring between the ages of twenty-three and fifty-eight, and generally in an individual in apparently perfect health.

PATHOLOGY.—The morbid changes which occur have already been fairly indicated in the case of Senator's [illegible]ich we have reported somewhat in full above. In the other cases observed, the pathological changes present much the same general picture. The primary stage seems to consist in an active acute inflammation, starting usually on one side of the oro-pharynx. This rapidly degenerates into a purulent infiltration, involving the deep layers of the mucous membrane. This pus infiltration seems to remain a pus infiltration to the end, in that in no instance has there been recorded any evidence of abscess formation in the tissues originally affected. The extension of the purulent infiltration seems to make its way along the great vessels, with a more marked tendency to extend downward than in any other direction. Thus, in Parisot's case, the extension made its way into the mediastinum, and finally into the pleural cavity, setting up an empyema. While the local disease of the pharynx changes rapidly into a purulent infiltration, this does not seem to extend along the mucous channels, as such, although there extends down the œsophagus, and into the stomach, and even into the intestines, a very active inflammatory process, verging on a proliferative inflammation. The same process, involving the air passages, takes on a somewhat œdematous character, giving rise to serous infiltration, together with active hyperæmia, involving the more loosely connected mucous membrane of the epiglottis, the ary-epiglottic folds and the ventricular bands, while in other portions, as in the trachea and bronchi, the process still remains an acute inflammatory catarrh. The morbid process, however, in the mucous membrane, whether in the air or food tract, is not of the ordinary active inflammatory type, but rather of the type which we meet in connection with septic diseases. It is a low grade of inflammatory action, in which the venous hyperæmia is prominent, giving a dull red, purplish hue to the membrane. The same, also, is true of the morbid process which is met with in the liver, spleen, and kidneys, which are not infrequently found swollen, as the result of a low grade of inflammatory action. Apparently as a secondary effect of the pus infiltration of the pharynx, we have the lymphatic glands of the neck, either on one or both sides, much swollen and infiltrated, while the cellular tissue also is infiltrated

to such an extent, in many instances, as to cause a swelling of such size as to fill up completely the angle between the jaw and the neck. In rare instances this extends down as far as the shoulder. This infiltration is of an inflammatory character, rather than suppurative, except so far as it extends along the great vessels of the neck. The morbid process in the pharynx, in nearly every case, has commenced on one side, and, curiously enough, this has been usually the left, although in some instances it seems to have been bilateral. Commencing unilaterally it rapidly develops, to such an extent as to involve both sides.

Symptomatology.—The onset of the disease, in every case, seems to be quite abrupt, the first sensation usually experienced by the patient being a sharp pain, referable to the faucial region, especially marked in deglutition. The pain is of a lancinating characer, and in no small degree simulates the feeling of a foreign body, such as a fish-bone, lodged in the throat. This may last from twelve to twenty-four hours, when there is an access of febrile movement, characterized by chilly sensations, pains in the bones, loss of appetite, and general malaise. The local symptoms in the throat now become more severe in character, the inflammatory process in the pharynx increasing in a marked degree so as to render deglutition, even at this period of the attack, exceedingly difficult, while, at the same time, the morbid process extends to the mucous membrane both of the œsophagus and air tract. At the same time the septic character of the disease is manifested by an involvement of the lymphatics, primarily of the side affected, which is followed very soon by a similar infiltration of the lymphatics of the other side. This swelling of the tissues of the neck may attain to a considerable size, giving rise to a somewhat hard, brawny tumefaction, not unlike that of a diffuse cellulitis, although the skin is not usually discolored. The febrile movement assumes rapidly a very grave type, in that the temperature may rise to 103°, or more, on the second day, while the evidence of the marked systemic invasion is shown by the occurrence, in nearly all the cases, of more or less well-marked delirium at this stage of the attack. As indicative, also, of the profound impression which the disease makes thus early on the constitution, the pulse becomes weak, thready, and exceedingly rapid; indeed, the whole aspect of the attack, as a rule, by the second or, at the latest, by the third day, would seem to show that the system has been invaded by some acute blood-poison of an infectious character.

As the local morbid process extends into the air passages, it gives rise to an œdematous infiltration of the more loosely attached areas of mucous membrane in the larynx, causing marked

dyspnœa, while its farther extension into the bronchial tubes is evidenced by the secretion of mucus or muco-pus. The voice, also, becomes early affected, assuming that peculiar piping character which occurs when the vocal cords are not especially involved in the morbid process, while the escape of the vocal tones is hampered by an obstruction above.

The morbid process also extends to the intestinal tract, and may probably have had much to do with the profuse diarrhœa, which was observed in Senator's second case, although this is not the rule.

Albuminuria seemed to occur in the majority of the cases where the examination was made, although there was none in Baruch's or Hager's cases. This is to be explained by the parenchymatous character of the inflammation which occurs in the kidneys.

As before stated, the inflammatory process in the pharynx develops into a purulent infiltration comparatively early in the disease. This, however, does not seem to extend to the mucous membrane of the air passages, but makes its way along the course of the great vessels. In Parisot's case this extended so far as to invade the mediastinum. In Hager's case pleurisy supervened, although, probably, it was not of a purulent character. The dyspnœa may be due, to an extent, to the swollen condition of the pharyngeal membrane, although it is ordinarily the result of an œdema of the ary-epiglottic folds or the ventricular bands. This symptom is usually a very prominent one near the onset of the disease, tracheotomy becoming necessary quite early in the course of Hewish's and Baruch's cases.

In Senator's second case an eruption occurred, extending over the thighs and lower portion of the abdomen and back. This consisted of a diffuse redness of the skin, having something of the character of the eruption in scarlatina.

In both Hewish's and Hager's cases the joints were affected, in the former being attacked with pains simulating rheumatism, while in the latter they were not only painful, but notably swollen.

The onset of the disease seems never to have been marked by a decided chill, but rather by obscure chilly sensations, which continue during the progress of the affection.

The subsequent development of the malady varies only according to the areas invaded by the local inflammatory process, while the systemic symptoms, as evidenced by the febrile movement and general prostration, continue somewhat unchanged to the end, delirium becoming, perhaps, more active in character, and the general failure of the vital powers being noticeable. In several of the cases reported, the fatal termination seems to have been preceded

by an apparent amelioration of all the symptoms, both general and local. This occurred in Senator's fourth case, in Baruch's, and in Hager's. This amelioration, however, seems to have been delusive, in that the fatal termination was only delayed in the former of the two cases, although in the latter recovery finally ensued.

DIAGNOSIS.—There is nothing in the morbid appearance, on inspection of the fauces at the onset of this affection, which gives warning of the exceedingly grave malady with which we have to deal. The diagnosis, therefore, must be based on the rapid development of a phlegmonous character in the local morbid process, together with the grave constitutional symptoms which occur early in the history of the disease. In no single instance, as far as I know, has the character of this affection been recognized on inspection before dangerous symptoms set in; nor, with the knowledge already gained from the ten cases recorded in literature, is it possible to establish a diagnosis merely from local inspection at the commencement of the attack. Those, however, who are accustomed to seeing large numbers of throat diseases will recognize, I think, an essential difference between an acute idiopathic inflammation of the mucous membrane in the upper air tract and one which is dependent on a constitutional condition. This, certainly, we demand of ourselves in the case of a gouty or rheumatic pharyngitis, and the suggestion occurs in this connection whether it may not be our duty to recognize that peculiar form of inflammation which occurs in connection with septic disease. Certainly, after it has been established that an inflammatory process is an accompaniment of septic disease, we recognize certain local appearances as indicative of such. The most prominent of these, perhaps, is the peculiar color of the membrane, which is of a dark red, verging on a purplish hue, in connection with an active, acute inflammation. The surface of the membrane, also, is of a dull, somewhat opaque appearance, in contrast to the glassy, semi-translucent condition met with in ordinary idiopathic inflammation. This, however, is somewhat in the way of suggestion, for certainly a failure of recognition of an acute infectious phlegmon in the pharynx, at its onset, by ordinary inspection, is not to be criticised.

The peculiar character of the pain which accompanies it may perhaps be suggestive, in that it occurs mainly on deglutition, and is of a sharp, lancinating character during this act. The swelling of the membrane, also, may be an important diagnostic factor as usually occurring on but one side, and being marked in character, the membrane projecting to a considerable extent forward into the pharyngeal cavity. The rapid extension of the inflammation should also excite apprehension.

Pain on pressure is always present, and yet this is not always an easy thing to establish, and when established is not prominently indicative of infectious phlegmon. The early occurrence, however, of the profound impression on the general system, as evidenced by the rapid and thready pulse, high fever, and especially the delirium, constitute symptoms which, when manifested, should immediately suggest this disease, especially when taken in connection with the occurrence of engorgement of the neck, this tumefaction being of a diffuse character, and one in which the individual glands cannot be recognized. This was present in every case which has been reported, with the exception of Baruch's, usually developing early in the course, although in Hager's case it was somewhat delayed in its appearance.

The presence of albuminuria, as well as enlargement of the spleen and liver, should be regarded as somewhat corroborative symptoms.

PROGNOSIS.—The disease is an exceedingly fatal one, and runs its course in a comparatively short time. The only recovery which has yet been reported was the case observed by Hager, in a man aged thirty-nine, and in whom the disease lasted forty-one days. In this instance the affection ran the usually rapid course, leaving the patient in a feeble and prostrated condition, from which the convalescence was exceedingly prolonged. In all the other cases death ensued, usually on the fifth or sixth day, although in Senator's fourth case the patient's life was prolonged till the sixteenth day, while in Carrington's a fatal termination occurred at the end of one day.

TREATMENT.—There is little in the recorded histories above given which carries much suggestion in the way of treatment, other than the active combating of such grave symptoms as may arise. In other words, we know of no remedy whose action seems in any way to arrest the progress or to ameliorate the virulence of the infective poison, which is the undoubted source of the disease.

Huesinger[1] reports a case, which, in many of its aspects, closely resembles and suggests acute infectious phlegmon, although he regarded it, at that date, as an instance of œdematous pharyngitis. The recovery, which occurred, is attributed to the very free scarification of the pharyngeal mucous membrane, followed by the application of nitrate of silver to the open wounds. This treatment certainly would commend itself in the early stage of the disease as offering fair hope of mitigating the severity of the attack, if not of arresting its progress.

In Hager's case, which recovered at the end of forty-one days,

[1] Deutsches Arch. für klin. Med., 1867, vol. ii., pp. 523–26.

the treatment was essentially symptomatic, although the drugs to which he attributed the best results were, antipyrine in controlling the febrile movement, and the free use of brandy for sustaining the vital powers.

It would seem that the tendency to death is due to the blood-poison, rather than to any direct or remote results of the local inflammatory process.

In Baruch's and Hewish's cases, tracheotomy was done on account of the laryngeal dyspnœa. In the latter of these cases the operation seems to have been attended with no good results, although in the former, while it seemed for the time to relieve the dyspnœa, the patient succumbed at the end of the ninth day. In this instance, therefore, it would seem that the local morbid process assumed so aggravated a type as to produce obstructive dyspnœa, which was relieved somewhat by tracheotomy, and yet, according to Baruch's statement, even here, death occurred as the result of the blood-poison. In this latter, then, we find the dangerous condition which it is the effort of treatment to combat. For this purpose, naturally, the free use of stimulants is demanded in connection with antipyretics, creosote, quinine, and other drugs of this character, as may be indicated. In other words, no general plan of treatment can be laid down, and each individual case will be treated according to the symptoms it manifests from day to day.

CHAPTER VII.

RETRO-PHARYNGEAL ABSCESS.

THIS name is used to designate a phlegmonous inflammation in the lower pharynx, which results in a suppurative process and abscess formation. The definition, it would appear, might also embrace a pharyngeal quinsy, and yet this form of abscess has no connection with the rheumatic habit, as is the rule in quinsy. In acute infectious phlegmon we meet with pus-formation in this region. This, however, is invariably due to a specific poison, which results in a purulent infiltration of the parts, without any tendency to abscess formation.

ETIOLOGY.—We are compelled to embrace under this classification a series of disorders which apparently have no direct clinical connection. The teaching originally, I think, advanced by Dupuytren,[1] and subsequently indorsed by Barmhuger,[2] Vogel,[3] and others, that a retro-pharyngeal abscess is nearly always due to caries of one of the vertebræ or of the occipital bone, has received general acceptance up to comparatively recent times We recognize the fact now, however, that, whereas this is perhaps a not uncommon cause of the disease, it really occurs more frequently as an idiopathic affection. It may also result as a sequel of one of the exanthems, or as a secondary deposit, the result of a burrowing of pus from neighboring parts. Bokai,[4] who has made a most elaborate study of the disease, covering an analysis of 204 cases, makes the following etiological classification:

Idiopathic, 179 cases.

Secondary, from burrowing of pus from abscess in the neck, 7.

Secondary to caries of the vertebræ, 7.

Secondary to scarlet fever, 9; measles, 1.

Traumatism from the presence of a foreign body, 1.

We thus find the very large preponderance of cases arise from what Bokai calls idiopathic causes. Further than this it is exceedingly difficult to assign any definite cause for the disease. It oc-

[1] Gaz. des Hôpitaux, 1851, vol. v., p. 374.

[2] "Krankh. des chylopoet. Systems," 1855.

[3] "Diseases of Children," American ed., from 4th German, 1869, p. 121.

[4] Jahrbuch für Kinderheilkunde, Wien, 1857–58, vol. i., p. 183; 1876, vol. x., p. 108.

curs as a rule in young children, presenting the ordinary appearances of perfect health, although not infrequently evidences of the strumous habit are observed. All of Bokai's cases occurred in children, his investigations having been made in the Children's Hospital at Pesth. That it is not confined to early life, however, is shown by reports of cases by McCoy,[1] Agnew,[2] Trélat,[3] Allen,[4] and Ingals,[5] the ages of the patients being respectively 24, adult life, 46, and 38, while in my own practice I have seen it as late as the age of 37. Agnew was inclined to think that in his case an ulcerated tooth acted as a contributing cause of the attack, which seems very plausible, when we consider how an affection of this sort may give rise to a suppurative otitis. In Allen's case the patient had recently recovered from a psoas abscess, which led the observer to suggest that it might have been secondary, belonging to that group of secondary metastatic abscesses occasionally seen in cases of convalescence from typhus and typhoid fevers. When it arises as a sequela of one of the exanthemata, it is easy to understand how the local inflammatory process in the fauces which often attends these fevers might constitute the active exciting cause of the suppurative inflammation. How the burrowing of pus from caries of the spine, or the presence of foreign bodies in the pharynx, may lead to the formation of pharyngeal abscess is quite clear, and needs no suggestion. French[6] reports a case in which a chicken bone, penetrating the tissues, gave rise to what he describes as a glosso-pharyngeal abscess.

Sex seems to exert no influence, it being met with indifferently in both males and females.

Martin[7] reports a case occurring in adult life, which seemed to be due to tertiary syphilis. The sequence of events appeared to be a suppuration of the cervical glands, and subsequently the development of a similar process in the lymphatics of the lower pharynx.

We thus find that, when we attempt to study this disease as it occurs in adult life, and endeavor to formulate any definite rules as to its etiology, we are confronted with the fact that each case is somewhat unique, and that to establish any general rules of causation becomes impossible. In child life, however, we meet with a very large number of cases, which present a somewhat definite and harmonious clinical history, in which the causation of the dis-

[1] Medical and Surgical Reporter, Phila., 1882, vol. xlvi., p. 313.
[2] Medical and Surgical Reporter, Phila., 1882, vol. xlvii., p. 65.
[3] Bull. de la Soc. de Chir. de Paris, 1882, n. s., vol. viii., p. 231.
[4] Arch. of Laryng., vol. ii., p. 46.
[5] Journal of Amer. Medical Association, vol. ix., p. 787.
[6] Arch. of Laryng., 1880, vol. i., p. 273.
[7] Revue Médicale de la Suisse Rom., 1881, vol. i., p. 622.

ease can be estimated with a certain amount of definiteness. In child life, the lymphatic structures are more active in their development, and more liable to become the seat of diseased action; and it is probably through these largely that the retro-pharyngeal disease develops. Hence, any localized cause in the fauces which may excite an inflammatory process tends to lead to the development of suppuration.

Among the local causes, then, we recognize the presence of foreign bodies, the local inflammatory changes in the exanthemata, such as measles and scarlet fever, and also diphtheria. Lewandowsky,[1] however, makes the point that the local inflammatory changes in scarlet fever are not really the exciting cause of the pharyngeal abscess, in that in two cases which came under his own observation the faucial inflammation was of an exceedingly mild type, while the nasal symptoms were more marked. He traces a connection, then, between the lymphatics of the nasal chambers and those of the pharynx, and attributes the pharyngeal abscess to the diseased condition of the nose. Whether the irritation be direct from the pharyngeal lymphatics or indirect from the nasal lymphatics, the conclusion seems fairly well established that the pharyngeal abscess arises primarily from inflammation and suppuration of the lymphatic structures. In the same manner, I think, we may find the primary source of irritation in a suppurative inflammation of the middle ear, as in the case reported by Wiel.[2] It would seem that the local disturbance of the pharyngeal lymphatics which leads to the development of abscess might remain latent for a considerable period of time. Thus, in the case reported by Pepper[3] the abscess did not develop until six weeks after the recovery from an attack of diphtheria.

PATHOLOGY.—In forming an estimate of the true pathological changes which occur in a pharyngeal abscess, we must necessarily recognize the clinical fact that in adult life an abscess belongs essentially to the cellular tissue, while in child life a suppurative inflammation in the areolar tissue is comparatively rare. Furthermore, that in child life the lymphatic tissues are in an active state of development, and therefore perhaps exceedingly prone to take on diseased action; whereas in adult life these tissues have undergone certain retrograde metamorphoses of the nature of an atrophy, as the result of which this liability to morbid activity is markedly lessened. Hence the pathological processes which characterize the development of retro-pharyngeal abscess in the adult differ in

[1] Berl. klin. Woch., 1882, p. 116.

[2] Monatschr. f. Ohrenh., Berlin, 1881, vol. xv., p. 43.

[3] Medical Times, Phila., 1875, vol. v., p. 817.

no essential degree from those of ordinary abscess formation which occurs in any part of the body. This consists simply in a local inflammatory action as the result of some irritation, local or secondary, which, taking on an excessive activity, results in such a high grade of morbid process that pus formation necessarily follows, simply by the crowding together in the tissues of the inflammatory products; the action of this being that the various cell elements which enter into the inflammatory product melt down into pus-corpuscles.

Practically, then, we find that the morbid process in retro-pharyngeal abscess in adult life differs in no marked degree from that which we describe in connection with an ordinary quinsy. When we come to study the disease in child life, however, I think we must adopt the view long since advocated by Bokaí, that the primary seat of morbid change occurs in the lymphatic structures of the pharynx. Of course this view must necessarily be based, to a certain extent, on clinical facts, in that the opportunities of close investigation of the localized morbid process would present very rarely. The prominent clinical fact, which seems to point to the lymphatic origin of the abscess, is the slow development of the suppurative process, this being, as we know, characteristic of suppuration in lymphatic tissues, in contradistinction to the somewhat rapid development of the same process in the cellular tissues. This, in connection with the fact, already referred to, of the proneness of these structures to take on a morbid action in young people, it seems to me, establishes beyond much doubt the fact that in these tissues lies the primary origin of these abscesses. In children, the abscess generally forms either in one or the other side of the lower pharynx, and in rare instances in the central portion. Of Bokaí's 204 cases, 85 occurred on the right side, 78 on the left, 38 in the median portion, while in 4 the location was not stated. Ordinarily the abscess forms in the visible portion of the oro-pharynx, rarely if ever extending above the border of the soft palate; although instances have been reported where it extended downward behind the œsophagus. Thus, in the case reported by Ripley [1] it extended down to the level of the first dorsal vertebra; while in a case observed by Richards [2] it extended as far as the third dorsal. In a case observed by Mercier,[3] the pus made its way through the tissues of the neck, and opened at the level of the clavicle. These, of course, refer to instances of the disease in childhood. In adult life, if the disease be idiopathic, it usually involves the whole of the

[1] Arch. of Pædi., 1884, vol. i., p. 184.
[2] Lancet, 1887, vol. ii., p. 659.
[3] Rev. mens. des Mal. de l'Enfance, 1883, vol. i., p. 308.

retro-pharyngeal wall. Where, however, it is due to the presence of a foreign body, or is secondary to a metastatic abscess, as in Allen's and Ingals' cases, the location of the phlegmon is dependent somewhat on adventitious circumstances. In these cases also the abscess is actively progressive, and extends not only rapidly but uninterruptedly. Thus, in Ingals' case the pus probably made its way into the pleural cavity.

SYMPTOMATOLOGY.—The clinical history and symptoms of a pharyngeal abscess in adult life and young children differ in such a marked degree that it will be necessary to consider them under different headings, in that whereas in the latter instance the disease pursues a somewhat definite clinical course, and gives rise to a train of symptoms which are uniform in their development, in the former cases the symptomatology is largely dependent on the cause and certain adventitious features of each individual case.

In Children.—The disease, as we have already seen, at this period of life is to be regarded as one of the manifestations of the strumous diathesis, and consists in a suppurative process, taking place in the lymphatic glands, thus producing a condition not dissimilar, except as to location, from suppurating glands in the cervical region. Its development, therefore, is somewhat insidious. A child becomes ill, as evidenced by loss of appetite, restlessness, perhaps slight cough, declines its food, and slowly loses flesh, with no prominent symptoms directing attention to any localized morbid process. This may last for several days, when finally some evidences of the involvement of the throat are shown, in the slight cough followed soon by a peculiar character of the voice, which Reigenier[1] describes as "*cri de canard*," that peculiar throaty voice, resembling somewhat the cry of a duck, a suggestion of which we not infrequently meet with in patients suffering from an ordinary quinsy. Deglutition also becomes not only painful, but even impossible; the child refuses the breast, on account of its inability to swallow. These symptoms, of course, call attention directly to the throat, and lead to an examination, which reveals the existence of the tumefaction. Dyspnœa becomes a prominent symptom in probably the majority of cases, sooner or later, owing to the phlegmon pressing upon the posterior wall of the larynx, or overhanging it in such a way as to interfere with the entrance of air. The child at this period of the disease is so markedly weakened that cyanosis follows very closely upon the dyspnœa. This latter is usually inspiratory in character, although where the tumor attains considerable size there may be interference with both movements of respiration.

[1] Concours Méd., 1882, vol. iv., p. 578.

So insidious is the onset of the disease in certain cases that the first attention may not be called to the existence of the localized disease in the pharynx for from four to six days, or even longer, after the commencement of the attack. In other cases, however, the very first manifestations of the disease may give rise to such prominent local symptoms as to call immediate attention to the pharynx. This is dependent, of course, mainly on the locality of the abscess. Thus, for instance, if it presents on the posterior wall of the pharynx, and bulges forward in the median line, dyspnœa and difficulty of deglutition appear early; whereas if it occurs low down in the lateral walls of the pharynx, and burrows behind the œsophagus or along the course of the great vessels in the tissues of the neck, the symptoms are masked, and the case takes a somewhat insidious course.

In certain cases we have the abscess developing as low as the post-œsophageal space, and here we have a condition which is somewhat curious, in that, whereas deglutition is accomplished with comparative ease, dyspnœa becomes a somewhat notable symptom. This is explained by the fact that a bolus of food, passing down the œsophagus, easily crowds the soft pus sac to one side, and yet the tracheal walls yield before the abscess, giving rise to tracheal obstruction. Here, of course, the dyspnœa is both inspiratory and expiratory. This condition of things was notable in the cases reported by Ripley,[1] Turner,[2] and Chapin.[3] In all these the source of the abscess was from caries of the vertebræ. The fixed position in which the child holds the head, inclined forward, or in case the abscess is unilateral the bending the head to the opposite side, as noted by Matthews,[4] constitutes a symptom of a certain amount of diagnostic value; indeed, Albert[5] goes so far as to regard this as almost pathognomonic. In Ripley's case the deep burrowing of the pus seemed to encroach in some way upon the cervical veins, giving rise to unilateral cyanosis of the face.

In adult Life.—When a retro-pharyngeal abscess develops in an adult, it makes itself known at its onset, as a rule, by well-marked symptoms, which call attention immediately to the existence of some morbid lesion in the faucial region. This probably is due to the fact, already noted, that at this period of life the morbid process consists in an ordinary phlegmon, involving the cellular tissue. If the disease were dependent upon caries of the spine, of course we could easily understand why its development should

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[1] Loc. cit. [2] Lancet, London, 1887, vol. i., p. 172.

[3] New York Medical Record, 1883, vol. xxiv., p. 584.

[4] St. Louis Med. and Surg. Jour., 1881, vol. xl., p. 642.

[5] "Chirurgie," vol. i., p. 357.

be somewhat insidious, as in children. I know of no case, however, in which this has occurred. Hence we regard it as an acute inflammatory process, resulting in suppuration, something of the nature of quinsy, without perhaps the rheumatic taint as a predisposing cause. The first symptom, therefore, to which it gives rise, will consist of pain referable to the faucial region. This is aggravated during deglutition, this act being not only painful but difficult of accomplishment, according to the extent to which the suppurative process has developed. Moreover, its onset is marked by notable general disturbance of a febrile character, in which the temperature may reach 101° to 102°, differing thus from the process which we meet with in child life, in that evidences of acute febrile movement are usually absent at the onset, although, as the disease progresses, a low form of fever sets in; a special point of distinction between the two forms being the absence of febrile disturbance at the onset in children, and its presence in adults. The symptoms, of course, vary somewhat according to the locality of the abscess. In a case reported by McCoy,[1] the phlegmon, developing in the pharyngeal wall, extended finally from the level of the larynx to the pharyngeal vault, giving rise not only to difficult deglutition, but to regurgitation of food. This, however, is not common, and the symptomatic history of the average of cases is completed in describing the existence of pain and difficult deglutition. These pains are deep-seated, somewhat boring in character, and are constant. They increase with the development of the disease, until the abscess ruptures. Dyspnœa, as far as I know, is rarely if ever present, and the general health is not seriously impaired, other than by the interference with the ordinary processes of alimentation.

DIAGNOSIS.—When once the attention has been called to the existence of some local lesion in the fauces, the recognition of a pus collection presents ordinarily no special difficulties, provided the parts are well exposed and thoroughly illuminated. In adult life, we find the appearances of ordinary phlegmon produced, which, if the abscess exists on either one or the other side of the fauces, will give rise to an asymmetrical condition of the parts, with the characteristic tumefaction of acute phlegmonous inflammation; the bulging portion presenting a bright red, somewhat glazed aspect, with that peculiar contour which we recognize as evidence of abscess formation (see Fig. 9). The diagnosis, of course, is established by palpation with the index finger, when fluctuation is recognized, or the peculiar elastic sensation imparted to the finger which indicates the presence of pus. Of course, technically, fluctuation cannot

[1] Medical and Surgical Reporter, 1882, vol. xlvi., p. 313.

be recognized by a single finger, and yet the sense of fluctuation by which the fluid wave, as it were, rebounds against the finger is almost as truly diagnostic. Where the abscess occurs in the middle region of the pharynx, in adult life, it not infrequently may escape recognition, in that the symmetry of the parts is not destroyed, while the broad, flat gathering of pus, elevating the whole of the pharyngeal wall, masks itself behind an almost plain surface. A close inspection of the parts, however, together with palpation by means of the finger or probe, should enable one to recognize the morbid condition present. Additional information is obtained by the impact of the probe, in that the small area immediately about the point of contact becomes exsanguinated or bleached out on pressing the probe into the parts, the blood returning slowly

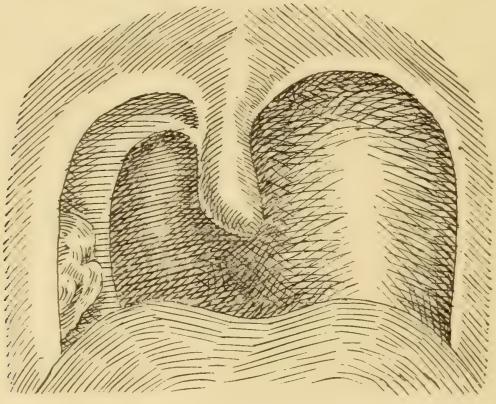

FIG. 9.—Retro-Pharyngeal Abscess, Phlegmonous Variety.

after the pressure is relieved. This, I think, is peculiarly characteristic of phlegmonous inflammation, especially after the abscess has formed.

In child life, a retro-pharyngeal abscess, as we have seen, is not the result of phlegmonous inflammation, but is of a more chronic character; hence the formation of pus is not attended with any active localized inflammation: in fact, the tissues about the abscess, and the mucous membrane covering it, present very slight evidences of the morbid process. Hence our recognition of the existence of the abscess must be based entirely on the asymmetrical condition of the parts, and the recognition of a pouching tumor encroaching upon the lumen of the pharynx. Having established by ocular inspection the existence of this tumefaction, its fluid character is to be recognized in the manner described above, namely, by means of palpation and probing.

The above refers to the ordinary type of cases. We meet, however, occasionally with instances which present unusual symptoms, and in which the diagnosis becomes by no means an easy matter. Thus Sands[1] reports a somewhat unique case, as follows: A child six months old, at the end of two weeks' illness, presented a large abscess in the cervical region, extending from the lower jaw half way to the clavicle, in front of the sterno-mastoid muscle. Suspecting a pharyngeal abscess, he explored the fauces with the index finger and found nothing abnormal. Plunging a hypodermic needle into the tumefaction to the depth of an inch, he obtained no pus. Upon palpating the tumor, however, it seemed to disappear rather suddenly. This disappearance, however, was followed by evidences of suffocation in the child. Upon exploring the pharynx, he found a large baggy tumor in the fauces, which he recognized as an abscess in this region. By this time the child's breathing had completely ceased; the surgeon, however, plunged his knife immediately into the pharyngeal tumor, evacuating a wine-glassful of pus, after which respiration was restored by artificial means, and the patient eventually recovered. The abscess seems to have been of lymphatic origin. We have already referred to the intimate relation between the lymphatics of the pharynx and those of the cervical region—a point, I think, which it is important to keep in mind, especially with reference to diagnosis, in that, as in the case above, these tissues may become involved in both regions: hence the existence of an abscess in the cervical region should always suggest the possibility of a similar condition of things in the pharynx, and lead us to make a thorough inspection of the latter region. This is not confined to the disease as it occurs in children, as is shown by the following case reported by Trélat:[2] A large tumefaction occurred in the cervical region, in connection with a similar swelling on the same side of the pharyngeal cavity, followed by suppuration in both regions. The interesting diagnostic point in connection with this case was the fact that the tumefaction crowded the cervical vessels so far outward as to produce really a pulsating tumor, which might have been mistaken for an aneurism. A somewhat similar condition of affairs existed in Agnew's[3] case. These cases, of course, were instances in adult life of the lymphatic form of retro-pharyngeal abscess, as the phlegmonous form confines itself entirely to the faucial region and is usually attended with no cervical complications.

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[1] N. Y. Med. Rec., vol. xxii., p. 106.

[2] Bull. de la Soc. de Chir. de Paris, 1882, n. s., vol. viii., p. 231.

[3] Loc. cit.

There are no important points to be made in connection with the question of differential diagnosis, although we are usually informed of the danger of mistaking a retro-pharyngeal abscess in a child for croup, bronchitis, or œdema of the glottis. How this mistake might be made we can easily understand when we consider that the only symptoms which manifest themselves oftentimes are cough in the early stages, suggesting a slight bronchitis, or, in the later stages, the development of dyspnœa, suggesting either a croup or œdema of the glottis. This mistake, it seems to me, need scarcely be made if the fauces are properly examined, as I think they should be in all cases in which symptoms are present which indicate a disturbance of any portion of the breathing apparatus, whether of the lungs, bronchial tubes, or upper air tract. If this examination be thoroughly and satisfactorily made, the existence of a pharyngeal tumor should scarcely escape recognition. Giraldes [1] suggests the administration of chloroform, for the purpose of making the diagnosis more complete. I quite agree, however, with Schmitz [2] and Bokai [3] in regarding this procedure as rarely called for as a diagnostic measure, although of course it may become necessary for operating purposes.

A phlegmonous abscess in adult life presents no special difficulties or dangers of mistaken diagnosis, other than those to be discussed in connection with the subject of quinsy. Indeed, as already stated, this form of abscess differs in no essential degree from an ordinary quinsy, except as regards the location. Mention should, however, be made, in this connection, of the possible danger of mistaking an aneurism for an abscess, as in the case reported by Duke [4] in which an aneurism, pouching into the pharynx, was opened in search of pus, with the result of almost fatal hemorrhage, although the patient's life was eventually saved by ligature of the common carotid artery.

Course and Prognosis.—Where the abscess is the result of a phlegmonous process, it runs its course in from five to ten days, discharging itself spontaneously, unless it has been previously opened by surgical interference. It involves no special dangers to life, and is attended with no grave complications, other than those discussed in the chapter on quinsy. If the disease be due to a suppurative process in the lymphatic structures of the pharynx, it runs a somewhat chronic course, its duration extending usually from two to four weeks. And whereas the mere existence of this lesion is an indication of the strumous habit, which should render the

[1] "Leçons cliniques sur les Maladies chirurgicales des Enfants," Paris, 1869, p. 361.
[2] Jahrbuch für Kinderheilkunde, Leipsic, 1872–73, Bd. vi.
[3] Loc. cit.
[4] Lancet, London, 1848, vol. i., p. 233.

prognosis somewhat grave, as a rule these cases do not succumb, provided the character of the disease is recognized. We find, therefore, that the disease in itself is not of a very grave nature, its most serious aspect being the danger of its being overlooked, and that the child may eventually succumb to the complications which it may entail.

As bearing on the failure to make a diagnosis, Matthews,[1] in reporting two cases which were treated successfully, recalls two other instances, occurring in the earlier years of his practice, which in the light of later experience he was convinced were cases of retro-pharyngeal abscess, and which had succumbed without a diagnosis having been made. Matthews' candor in making this report is most creditable, as it carries much of suggestion and instruction. While, therefore, the disease in itself does not tend necessarily to a fatal result, complications may arise to hasten this end. Thus, in the case reported by Schmitz[2] the immediate cause of death was œdema of the glottis; while in cases reported by Justi[3] and Gaupp[4] spontaneous rupture of the abscess occurred, and the pus, making its way into the air passages, caused suffocation. In an instance reported by Carmichael,[5] in a child five weeks old, the abscess, burrowing in the direction of the large arteries of the neck, eroded their walls, as the result of which a fatal hemorrhage set in on the sixth day. A post-mortem examination showed that the abscess communicated with the external carotid. Cases of fatal hemorrhage also from the carotid arteries or their branches are reported by Gautier,[6] Bokaí,[7] and Lidell.[8]

When we consider that retro-pharyngeal abscess occurs in young children, whose vitality is impaired by the strumous habit, it is easy to understand how pulmonary troubles should constitute a very serious complication of the disease, especially in those instances in which the abscess gives rise to a respiratory obstruction. Thus, Temoin[9] has reported two instances in which the immediate cause of death was broncho-pneumonia. Bokaí[10] seems to think that this complication arises from the penetration of pus into the air passages; although quite as rational an explanation would seem to be in the respiratory obstruction, this acting to produce pulmonary lesions in much the same way as an attack of membranous croup.

That œdema of the glottis should be a frequent complication we

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[1] St. Louis Med. and Surg. Jour., 1881, vol. xl., p. 642 Loc. cit.
[3] Deutsche med. Wochenschr., 1877, vol. iii., p. 294.
[4] Würtemb. Corr. Bl., 1870, vol. xl., No. 23.
[5] Edinburgh Med. Jour., 1881, p. 24.
[6] Thèse de Paris, 1869. [7] Loc. cit.
[8] Amer. Jour. Med. Sciences, Oct., 1883, p. 321.
[9] Rev. Mens. des Mal. de l'Enfance, 1887, vol. v., p. 172. [10] Loc. cit.

can easily understand, and yet that it is not necessarily fatal is evident from the case reported by Ellis [1] in which a child survived this accident, and that without tracheotomy having been performed.

We find, therefore, that while the affection runs a somewhat protracted course in instances of lymphatic abscess, it is not necessarily fatal, except from complications that may occur, or in the failure to make a diagnosis. Where the diagnosis is not made, the tendency to death is primarily by a gradual failure of the vital powers from lack of nourishment and deficient oxygenation of the blood, as in the case reported by Elliott,[2] although of course the great danger of allowing the case to go unrecognized is in the increased liability of serious complications arising.

The following case, which recently came under my own observation, is of especial interest as illustrating the insidious development of the disease as well as the difficulty of diagnosis.

E. F., aged thirty-two, consulted me on Dec. 29th, 1891, with the following history: From the age of six until he was twenty-one he had had annual attacks of quinsy, but none since. Four months ago there developed a tumefaction in the left side of the pharynx, which had slowly increased in size until two weeks since, when it commenced to grow rapidly. There were never any evidences of acute inflammatory action. During the previous fortnight he had suffered much from a dull, aching pain in the fauces, and there was notable difficulty in deglutition, with nocturnal attacks of dyspnœa. Three weeks ago there appeared an indurated mass in the left cervical region, which had increased with the faucial tumor. He had been seen by a throat specialist, who pronounced the disease malignant. He was referred by him to a general surgeon, who, however, declined to operate. When I examined him there was a large ovoid tumor in the left side of the oro-pharynx, pressing the soft palate well forward into the oral cavity, and which extended down to the orifice of the œsophagus, pressing upon the epiglottis and crowding it to one side. It extended three-fourths across the oro-pharynx, was rounded in outline, and presented every appearance of a neoplasm. The mucous membrane covering it was normal. It was dense and resisting to the touch and gave the impression of a fibroid tumor. The induration in the neck was of the size of the palm of the hand, and had the same dense feeling as the faucial tumor, and lent weight to the suspicion of malignancy. A slight resiliency in the mass led me to suspect that the contents were fluid. I therefore passed a slender tenotomy knife well into the tumor, and found it to be a retro-pharyngeal abscess. The evacuation of the pus resulted in the complete disappearance immediately of the cervical tumefaction and the entire relief of the patient. The whole aspect of the case was that of malignancy, with the exception of the clinical history perhaps, and I was not surprised at the opinion which had been given, and on first view was disposed to confirm it.

In those cases where the disease is symptomatic of caries of the vertebræ, the affection develops rather insidiously, and extends slowly by burrowing along the course of the vertebral column, and

[1] Cincinnati Lancet Clinic, 1885, n. s., vol. xv., p. 705.

[2] Brit. Med. Jour., 1879, vol. i., p. 663.

may extend down behind the œsophagus, as far as the second or third dorsal vertebra. The following case reported by Ripley[1] is rather instructive, as showing the insidious progress of the disease, and its long continuance without recognition: The case was that of a child three years of age, who had been ill for two months and a half before it came under observation, and a year previously had gone through an attack of measles. One month before the reporter saw the case, a dry cough developed, and for the week previous there had been considerable dyspnœa. During this past week, the mother had noticed that the child's head was stiff and thrown backward, and that a swelling had developed around the root of the neck, somewhat of the form of a ring. When the child was examined, it was found that the dyspnœa was of an inspiratory character, the voice was slightly hoarse, and that the veins of the neck were distended. Digital examination of the pharynx revealed a bony projection on the posterior pharyngeal wall. A diagnosis of caries of the vertebræ was made, the hoarseness being explained by pressure upon the recurrent laryngeal nerve. A short time after, the dyspnœa having increased, tracheotomy was done. This was followed by death fifty-two hours after the operation. Necropsy revealed an abscess in front of the fifth and sixth cervical vertebræ, the vertebræ being invaded from the fourth cervical to the first dorsal, the abscess being situated immediately behind the œsophagus.

This is a somewhat illustrative case, and yet here, whereas the caries had existed for some months, it is difficult to determine how long the abscess had been present. In a case observed by Mercier[2] the caries was known to have been present eighteen months, whereas the pharyngeal abscess had only existed a few weeks. The caries in this case was due to an injury, and the child eventually recovered. In the case reported by Chapin[3] the disease lasted six months, the abscess forming apparently early in its history, and yet it was never visible in the pharynx, and was only discovered post mortem. Richards'[4] case was very similar, the abscess apparently having existed for three months without manifesting itself in the pharynx. This was also discovered post mortem.

We thus find that the prognosis in these cases is usually fatal, the caries of the spine being dependent upon a strumous condition, which renders the pharyngeal abscess merely symptomatic and complicative; the only instance of recovery that I recall being that of Mercier, in which the vertebral disease was of traumatic origin. The immediate cause of death in these patients is practically the

[1] Loc. cit.
[2] Rev. mens. des Mal. de l'Enfance, 1883, vol. i., p. 308.
[3] Loc. cit.
[4] Lancet, London, 1887, vol. ii., p. 659.

same as in the lymphatic abscesses, either by inanition, suffocation, or a complicating broncho-pneumonia.

TREATMENT.—If the abscess be of the phlegmonous character, such as is met with in adults, the indications for treatment are practically the same as those of an ordinary attack of pharyngeal quinsy, viz., the evacuation of the abscess as soon as the existence of pus has been determined, or the scarification of the parts, even before the pus sac has been recognized. Where the disease is due to a suppuration of the lymphatic tissues of the pharynx, the indication here also is for the evacuation of the pus at as early a date as possible, thus avoiding the complications which so seriously threaten to intervene in these cases. The point at which the abscess should be opened is the most dependent portion of the pus sac, thus securing a thorough evacuation of the cavity, and establishing subsequently free drainage. Of course, in doing this it is to be borne in mind that a large amount of pus, pouring into the air-passages of an infant, is likely to make its way into the larynx and trachea below, with dangerous consequences. Hence, the child should be held in an inverted position as soon as the pus begins to flow, in order to avoid this danger. Johnston[1] makes the point that the abscess should be opened in the upper portion, in order to avoid the flow of pus into the air passages. This may possibly seem wise in certain instances, but I think that usually preference should be given to the lower opening, in that if the pendant portion of the abscess is unopened, pus tends to accumulate there, and the duration of the disease is unnecessarily prolonged. As we have already seen, suppuration of the lymphatic glands of the pharynx is very intimately associated with a morbid condition of the cervical lymphatics, and is occasionally attended with a similar process in this region. Where this latter condition exists, of course the opening should be made externally, and the incision carried sufficiently deep to evacuate the pus accumulation in the pharynx. As we have already noticed, Trélat made the opening completely through from the pharynx to the neck, thus establishing external drainage. Burckhardt[2] goes so far as to advise that in all cases of retro-pharyngeal abscess due to suppuration of the lymphatics, the opening should be made externally through the tissues of the neck. He makes his incision along the anterior border of the sterno-mastoid muscle, and, crowding the great vessels to one side, goes on till the pus sac is reached. This operation possibly may be indicated where the abscess is low down and not easily accessible through the pharynx. Where, however, it can be readily brought into di-

[1] Maryland Medical Journal, 1880, p. 160.

[2] Centralblatt für Chirurgie, 1888, vol. xv., p. 57.

rect view I am disposed to think that the majority would much prefer the simpler method through the mouth. Stoerk[1] has devised a specially constructed knife, which he calls a pharyngotome, for opening these abscesses; while Schmitz[2] makes use of a guarded or concealed knife for this purpose. The operation, however, is a comparatively simple one, and can easily be accomplished by means of an ordinary bistoury. If it seems desirable, a portion of the blade can be wrapped with adhesive plaster, or some other material for protecting the cutting edge up to within a quarter or a third of an inch of its extremity, to prevent too deep an incision. If the child cannot well be controlled otherwise, it may be necessary to administer an anæsthetic, a few whiffs of chloroform being sufficient to secure as much relaxation as is ordinarily needed for such an operation.

As regards external applications, such as poultices, hot compresses, iodine, and other medicaments, they are probably not usually indicated for the relief of a suppurative process. This demands evacuation at as early a date as possible. If after the discharge of the pus there still remains lymphatic engorgement, it may be wise to make use of external applications of iodine, in some of its various preparations, to dissipate this. The main indication, however, after the evacuation of the abscess, is the building up the system by the administration of tonics; the best of which, perhaps, is cod-liver oil, to which should be added the syrup of the iodide of iron, for the correction of the strumous habit, which undoubtedly underlies the very large majority of these cases. This general medication, however, will usually be carried out according to the indications which each individual case may present.

In the treatment of a disease which is dependent upon a caries of the verterbræ, the indications are practically the same as those already suggested in connection with a lymphatic abscess, viz., the early evacuation of the pus. It should be borne in mind, however, here that the purulent accumulation in the pharynx is merely symptomatic of the graver form of disease which lies behind it, and that, while the local complication threatens serious danger in the way of obstructed respiration, dysphagia, or pulmonary trouble, the serious feature of the disease is a caries of the spine, which usually terminates fatally. Of course, if dyspnœa become urgent, it will be necessary to open the trachea without delay. That, however, this is not always successful in saving the patient is shown in a case reported by Turner,[3] where a low burrowing abscess gave

[1] Pitha and Billroth, "Allg. und Spec. Chir.," vol. iii., folio viii., first half, p. 120.

[2] Jahrbuch für Kinderheilkunde, Leipsic, 1872–73, vol. vi., p. 283.

[3] Lancet, London, 1887, vol. i., p. 172.

rise to such dyspnœa as to demand tracheotomy. The child subsequently died, however, of pneumonia. Whether this was due to the operation or to the abscess does not appear, and yet it is well to bear in mind that both conditions involve a certain danger of pulmonary disease. We have already noticed the peculiar feature, in certain cases, that the abscess, while not producing dysphagia, presses so far on the trachea as to give rise to marked dyspnœa. This would seem to carry the suggestion that in performing tracheotomy the tube should be inserted as low down as can conveniently be done.

CHAPTER VIII.

ACUTE UVULITIS.

THE pendulous portion of the velum palati may occasionally become the seat of an acute inflammatory process. When this occurs, as the result probably of the fact that the organ is composed of soft, yielding tissues, and hangs freely in the fauces, the morbid process is liable to take on an œdematous form.

ETIOLOGY.—The prominent predisposing cause of this affection lies undoubtedly in the size of the normal organ. Occasionally we meet with a uvula which is almost rudimentary in size. I have never seen an acute attack of uvulitis in such a case. On the other hand, where the organ is broad and pendulous, it is very likely to become the seat of repeated attacks of acute inflammation. These attacks are usually excited by taking cold. We have rather insisted heretofore on the point that repeated attacks of acute inflammation are really a symptom of chronic inflammatory action. This is true to a certain extent of the uvula, which we occasionally find in a state of chronic inflammation in connection with chronic pharyngitis or naso-pharyngeal catarrh. Why these two affections should cause it, is easily understood. The mucus accumulation in the fauces and the violent and prolonged efforts at expelling it necessarily act as an irritant to the pendulous uvula, dragging it down, as it were, and inducing a localized plethora.

Lennox Browne[1] takes the ground that it frequently accompanies the arthritic habit and is also accompanied with disturbances of the digestive apparatus. We can easily understand this in recognizing the view already advanced that pharyngitis is usually intimately associated with a disordered condition of the stomach.

Probably the most frequent cause of it is an attack of quinsy, the œdematous uvula filling up a large portion of the space left between the peritonsillar abscess and the faucial wall of the opposite side. In these cases it adds no little to the distress of the patient, and yet the condition is to a certain extent masked by the distressing symptoms of the suppurative inflammation.

It not infrequently comes on in connection with an acute phar-

[1] "The Throat and Nose and their Diseases," 3d ed., London, 1890, p. 229.

yngitis, in which case it usually develops quite early in the course of the attack and rapidly assumes distressing features, giving rise to pain on deglutition and even dyspnœa with suffocative attacks, as occurred in a case reported by Carter.[1]

In a larger proportion of instances probably it occurs spontaneously and without any involvement of the surrounding tissues, the first symptom that the patient experiences being a sensation of a lump or foreign body in the fauces, followed soon by more or less discomfort or pain in deglutition. As the organ increases in size, it gives rise to an irritating cough, with dyspnœa, and perhaps suffocative attacks, dependent on the extent to which it encroaches upon the faucial isthmus. A number of cases have been reported by Ballet[2] and Morgan[3] in which the symptoms assumed a somewhat serious character almost from the onset of the attack.

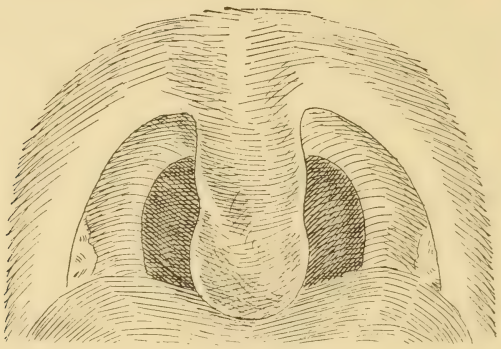

FIG. 10.—Acute Uvulitis.

Traumatism also is an occasional source of the attack, as it may follow the accidental swallowing of hot water, ammonia, oxalic acid, or other chemical irritants.

It occasionally occurs in connection with ulcerative processes in the pharynx, especially the deep ulcers of syphilis.

The incautious use of caustic applications to the fauces also may give rise to an œdema of the uvula, as in a case reported by Cohen.[4]

PATHOLOGY.—The changes which occur in the organ are essentially those of acute inflammation, in which the serous exudation of the second stage assumes unusual prominence. The morbid process is confined also almost entirely to the mucous membrane,

[1] Med. News, Phila., 1883, vol. xlii., p. 354.
[2] La France Méd., 1885, vol. i., p. 316.
[3] New York Med. Record, 1889, vol. xxxv., p. 684.
[4] "Diseases of the Throat and Nasal Passages," New York, 1879, p. 220.

although probably the azygos muscle is infiltrated to a certain extent.

DIAGNOSIS.—The condition is easily recognized. On inspection the uvula will be seen presenting a large, rounded mass hanging freely into the fauces (see Fig. 10), of a bright red color where it is attached to the palate, and presenting all the evidences of acute inflammation. The lower portion of it, however, exhibits the whitish-gray, semi-translucent aspect, so characteristic of œdematous inflammation. The œdema is more marked on the posterior portion of the organ, and runs up in a prominent ridge toward the upper surface of the palate. If the organ is of large size and the tension upon its mucous membrane is very great, it seems to give rise to a vascular stasis, as it were, the pressure of the infiltration arresting the flow of blood to such an extent as to give a dark red or even purplish appearance to the upper portion of the œdematous organ.

PROGNOSIS.—An œdematous uvula does not give rise to anything more than distressing and somewhat threatening symptoms at the time of the attack. I know of no fatal case having occurred, nor is it easy to understand how such an issue could take place, and yet in Carter's[1] case the patient was compelled to insert a clay pipe into his fauces to enable him to breathe while awaiting the arrival of the physician.

TREATMENT.—The gargling with hot water or ice water, or the swallowing of pellets of ice, local applications of astringents such as tannin, sulphate of iron, nitrate of silver, etc., may afford a certain amount of relief, yet I have never seen a case in my own practice in which these procedures afforded anything more than but slight relief.

I think the first resort in all cases should be in free puncture by means of a slender, sharp-pointed bistoury. These punctures, to the number of ten to twenty, if necessary, should be made over the whole of the organ, especially round the lower portion and upon its posterior surface if such can be reached. It is rarely necessary to penetrate more than through the superficial layers of the mucous membrane, to the depth of perhaps one-eighth of an inch. In this way there will follow a free flow of serum, with the result in most instances of marked and immediate relief, and the total disappearance of the œdema in the course of a few hours. Although the letting of blood by the puncturing is not especially indicated, there is, of course, no objection to it.

Puncturing I regard as a far better procedure than linear scarification, in that by this measure the reduction of the swollen organ

[1] Loc. cit.

is easily accomplished and the treatment is not followed by a distressing sore throat, which might ensue from scarification.

In a somewhat aggravated case which occurred in my own practice some years since, scarification failing to give immediate relief, I proceeded to amputate the uvula, which was fully five-eighths of an inch in diameter. The relief was complete and the procedure was followed by no untoward symptoms. Cohen's and one of Ballet's cases were treated in the same manner.

Carter seemed to think that the application of a fifteen-per-cent solution of cocaine afforded relief in his own case. In my own experience this remedy is of little avail in a well-developed condition of œdema.

Chronic Uvulitis.

We occasionally find the mucous membrane covering the uvula in a state of chronic inflammation, as evidenced by its reddened color and semi-relaxed condition. I have never seen an instance in which this condition was primary. It occurs most frequently in connection with chronic pharyngitis or chronic naso-pharyngitis. It also is met with in certain instances in connection with an elongated uvula. This is the condition which is often referred to by the term relaxed sore throat. It possesses no special clinical significance, gives rise to no symptoms which are to be directly attributed to the inflammation of the mucous membrane, nor usually does it call for any direct local treatment.

The condition being entirely secondary, indications for treatment consist in the treatment of the disease upon which it depends. If the uvula is elongated, the chronic inflammation will probably disappear after uvulotomy. If it is dependent on a pharyngeal or naso-pharyngeal disorder, the treatment must be directed to this region. We may meet with it in connection with tonsils in a state of hypertrophy or chronic inflammation with hypertrophy, in which case, of course, the disease will only disappear by proper measures directed toward these organs.

CHAPTER IX.

ELONGATED UVULA.

THE pendulous uvula in a healthy throat should hang freely in the faucial isthmus. In other words, a normal uvula should be of such length that when the fauces are at rest, it does not touch or impinge upon the parts below. When, on the other hand, a uvula hanging from the edge of the palate impinges upon the base of the tongue, epiglottis, or parts below, it should be regarded as an abnormality. This condition is usually designated as an elongation of the uvula, and this term is restricted simply to that condition in which the organ, while of an unusual length, presents no evidence of morbid action, such as chronic inflammation, infiltration, etc.

ETIOLOGY.—I believe in most instances the condition is primarily congenital, and that, whereas in the earlier years of life it may not give rise to notable symptoms as a consequence of its abnormal length, the functional activity of the fauces tends to exaggerate the condition, without necessarily involving any chronic inflammatory action. As a result of this condition, there necessarily ensues a liability to recurrent attacks of sore throat, which involve the mucous membrane covering the uvula. Moreover, as a consequence of these repeated attacks of inflammation, the elongation is increased.

PATHOLOGY.—I have never known a case in which the azygos muscle was involved in an elongated uvula. The central portion of the mass is made up of the white fibrous and yellow elastic tissue, which is found in the lower portion of the normal uvula. This is traversed by numerous blood-vessels, while externally the mass is covered with healthy mucous membrane, somewhat loosely attached to the tissues beneath. The elongation occurs from above downward, and as the organ becomes elongated it maintains, I think, as a rule, its original diameter. In other words, it does not seem to be stretched out, but rather maintains its lateral bulk as it elongates. Furthermore, I do not think that we ever have any lateral growth in an abnormally long uvula. In other words, if there is any hypertrophic development here, it confines itself to a linear extension, and never develops any tendency to a lateral hypertrophy.

The length of the normal uvula in a healthy adult will possibly average about three-eighths of an inch. In the large majority of cases of elongated uvula which come under our observation and demand interference, the length is perhaps from five-eighths to three-quarters of an inch. The most extreme case which ever came under my own observation was in a boy aged fourteen, who presented with a uvula which measured an inch and a half. It hung down beyond the base of the tongue and impinged upon the larynx, giving rise to a most distressing cough. The organ was slender, uniform in size, and perfectly healthy in appearance, aside from its length. Winslow[1] reports having seen a case in which the organ measured three inches in length, and terminated in a bulbous extremity three-quarters of an inch in diameter. This patient was in the habit of "swallowing his palate," to get in out of his way.

SYMPTOMATOLOGY.—The symptoms to which this condition gives rise are to no small extent dependent upon the temperament of the patient. In many instances we find an unusually long uvula lying upon the base of the tongue and even impinging upon the epiglottis without causing any annoyance, whereas in another case a slight impingement of the uvula upon the base of the tongue gives rise to quite distressing symptoms.

These consist of a sense of irritation or tickling in the fauces, with the feeling of a foreign body, which the patient constantly endeavors to expel by hawking or clearing the throat. As the parts become more sensitive a cough may be set up, either by the impingement of the organ upon the base of the tongue or as a consequence of the upper portion of the larynx being encroached upon.

Deglutition and phonation are not notably affected except when the organ becomes the seat of acute inflammation. If, however, the organ is of such length as to impinge upon the larynx, a chronic laryngitis may be the result, in which case the voice is notably impaired. A perfect singing voice demands that every portion of the upper air tract shall be in a condition of health. It is easy to understand, therefore, how a singer might be seriously hampered by the existence of an abnormally long uvula. Labus,[2] in a somewhat elaborate discussion of the influence of an abnormal uvula upon the singing voice, finds that it interferes with the taking of certain notes, the enunciation of certain vowels, and the purity of certain tones. According to Coën,[3]

[1] New York Med. Record, 1886, vol. xxviii., p. 66.

[2] Revue mens. de Laryngol., 1882, vol. ii., p. 214.

[3] Wien. med. Presse, 1887, vol. xxviii., pp. 870, 901.

the uvula vibrates in consonance with certain notes in the musical register—a function which necessarily would be impaired by any abnormality.

Attacks of suffocation or spasm of the glottis are by no means uncommon in connection with this condition, especially in patients of nervous temperament. This may arise from a simple reflex action from irritation of the base of the tongue, but it is more probable that it is directly excited by the uvula dropping into the laryngeal cavity or impinging upon the epiglottis.

The cough is usually a dry, irritating, persistent cough, what is usually termed a nervous cough, and is not ordinarily accompanied by any expectoration unless there be a complicating catarrhal inflammation in the fauces. An especial feature of the cough, as well as of the other symptoms, is the exacerbation on lying down. In the recumbent position the uvula lies upon the posterior wall of the pharynx and may give rise to cough, choking attacks, or spasm of the glottis.

In a rather interesting case which came under my observation an elongated uvula had given rise to repeated paroxysms of asthma, not of a very severe type, but accompanied with sibilant and sonorous bronchial râles. Uvulotomy gave complete relief, and there was never a recurrence of the asthma.

DIAGNOSIS.—It would seem an exceedingly easy matter to recognize an elongated uvula on simple inspection of the fauces, and yet it may often be a question whether the uvula is of sufficient length to give rise to morbid symptoms. If any symptoms are present referable to the fauces, I think it quite safe to act upon the rule that the normal length of the uvula in an adult is rarely over three-eighths of an inch. If we find an organ of much greater length than this, I think we are safe in regarding it as one which is capable of being a source of disturbance, especially when we consider the difficulty of deciding whether the tip of the organ impinges upon the parts below, owing to the great mobility of the fauces. If we depress the tongue sufficiently, of course, a markedly elongated uvula will hang freely, and to decide whether it is impinging upon the base of the tongue is largely a matter of judgment.

PROGNOSIS.—This condition involves no grave danger, but on the other hand it may be a source of no little distress and even of suffering to the patient. Furthermore, it is not a condition which tends to get well. To one accustomed to use the higher powers of the voice, viz., in singing or recitation, the prognosis as regards preservation of the voice is, I think, somewhat unfavorable. The constant presence of an abnormally long uvula not only temporarily

impairs the singing voice, but tends to give rise to morbid changes in the air passages below, under the influence of which this impairment not only increases, but a serious danger of permanent loss is threatened.

TREATMENT.—No local applications are of any avail whatever in the treatment of this affection. A certain amount of temporary relief may be afforded by the local application of iron, tannic acid, nitrate of silver, and remedies of this sort, but this relief is of the most ephemeral kind. The only means of treatment that possesses any permanency consists in the removal of the superfluous portion of the organ. I have seen a number of cases upon which in former years uvulotomy had been performed, totally removing the organ, the amputation being made in a line with the edge of the palate. I not only know of no justification for this procedure, but I regard it as an exceedingly vicious practice. The whole uvula is not the source of the symptoms, but only the redundant portion of it. This organ, moreover, possesses an important function, as we have seen, in phonation and its total removal necessarily involves permanent impairment certainly of the higher powers of the voice. In operating, therefore, the amputation is made in such a way as to leave a uvula of the proper length. As before stated, this in an adult should be about three-eighths of an inch in length.

Various methods have been practised and a number of instruments have been devised for performing the operation of removing the uvula.

Hippocrates,[1] while occasionally using cutting instruments, preferred to remove the redundant portion by means of his finger nail. Celsus[2] seized it with a vulsellum, and excised below the point engaged. Fabricius[3] preferred the use of the scissors. Scultetus[4] devised a fenestrated instrument by means of which a ligature was placed around the organ and the redundant portion allowed to slough away at the end of the second or third day. Paré[5] also preferred the ligature.

Most of the older surgeons, however, such as Albucasis,[6] Avicenna,[7] Oribasius,[8] and Aetius[9] preferred the use of cutting instruments.

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[1] Cited by Lisfranc: Revue Méd., Paris, 1823, vol. xi., p. 241.

[2] Milligan's Edition, Edin., 1831, p. 357.

[3] "Opera Chirurgica," Lugduni Batav., 1723.

[4] "Armamentarium Chirurg.," Lugduni Batav., 1693, p. 20.

[5] Paré: "Œuvres Complets," par Malgaigne, Paris, 1840 and 1841.

[6] "De Chirurgia Arabice et Latine." Cura Johannis Channing, 3 v. in v., 4to, Oxford, 1778.

[7] "Arabum Medicorum Principis," Venetiis, 1595.

[8] "Collectorum Medicinalium, Joanne Baptista Rasario Interprete," Parisiis, 1555.

[9] Aetius, Basileæ, 1535.

The Arabian surgeons resorted to the use of caustics both chemical and potential. In Persia the operation is usually done by the barbers, who place a wooden spatula behind the uvula and excise it with a sort of chisel.

According to Tholozan,[1] the restless movements of the uvula, together with the arching of the tongue, occasionally render it difficult to grasp and control the organ. This seems to have sug-

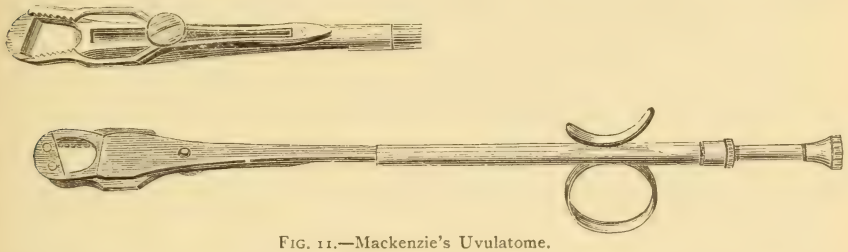

FIG. 11.—Mackenzie's Uvulatome.

gested to Bell[2] the construction of a guillotine, which consisted of a flat plate of metal with a rounded opening in its distal extremity, upon which a blade was made to slide. As soon as the uvula fell into the fenestra, the blade was driven home by a quick movement and the organ cut through before it was retracted by the palatal muscles. Bell's uvulatome is of special interest in having suggested to Fahnestock the construction of a tonsillotome on the same principle.

Mackenzie has modified this instrument by adding a simple device for seizing the severed portion (see Fig. 11); while Elsberg con-

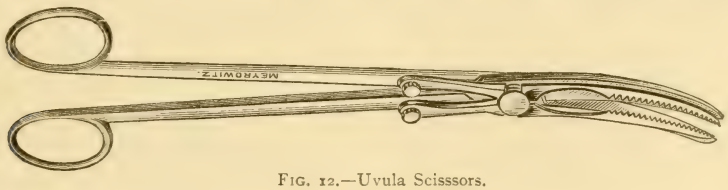

FIG. 12.—Uvula Scisssors.

structed an instrument on the same general principles which acted by means of a spring; the instrument being placed *in situ* and the blade being drawn back, it was brought into play by simply touching a trigger.

A number of different forms of scissors have been devised which are supposed to facilitate uvulotomy. As a rule these consist in adding to the ordinary surgical scissors a claw which shall seize and hold the cut portion of the uvula, thus preventing its falling into the passages below (see Fig. 12).

[1] Bull. de l'Acad. de Méd., Paris, 1884, 2 s., vol. xiii., p. 8.

[2] "System of Surgery," 1783, vol. iv., p. 144.

[3] "Diseases of the Throat and Nose," Am. Ed., Phila., 1880, vol. i., p. 29.

Seiler[1] goes still further and curves the end of one of the blades of the scissors to a right angle. A similar instrument has been devised by MacDonald.[2]

These latter instruments are undoubtedly exceedingly useful in that they prevent the uvula from slipping beyond the blade of the scissors, as may easily occur. The claw scissors should never under any circumstances be used; they serve to complicate what is really quite a simple operation, for if one attempts to amputate a

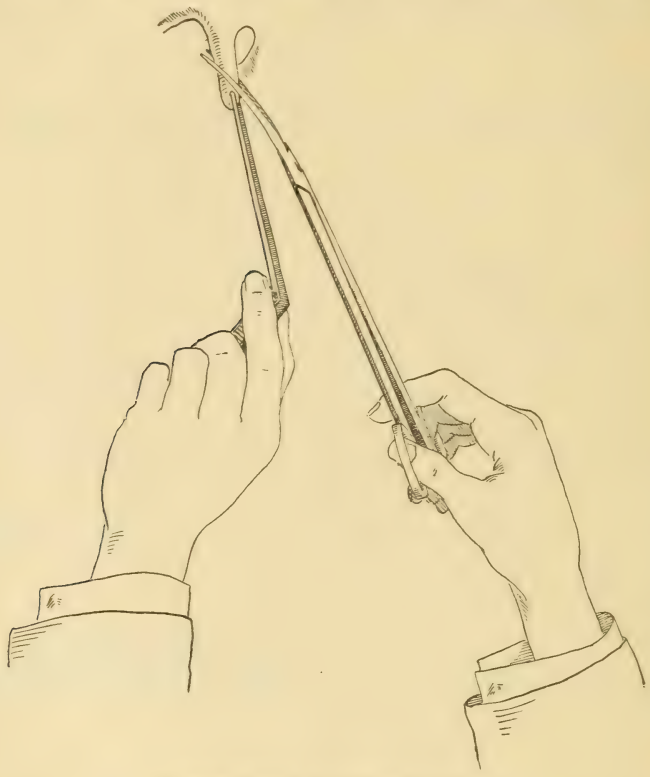

FIG. 13.—Method of Cutting the Uvula.

uvula with such an instrument without first seizing it with the forceps he will in most instances not only fail in his operation but will inflict unnecessary distress on the patient.

I have referred to these instruments somewhat at length in that the matter possesses a certain amount of interest; and yet practically I think that no special instruments are required for the operation. In my own practice for years I have contented myself with simply seizing the tip of the uvula with a pair of mouse-toothed

[1] "Diseases of the Throat," 2d ed., Phila., 1889, p. 243.

[2] Lancet, London, 1887, vol. i., p. 935.

forceps held in the left hand, and, drawing it forward on the dorsum of the tongue, cutting the redundant portion off with a pair of the ordinary curved scissors, as shown in Fig. 13. Care should be exercised not to draw too vigorously upon the organ, as in this manner the mucous membrane is drawn down in such a way that after the section is made it retracts, leaving a large cut surface protruding from the tip. It is also important, I think, in making the section to cut from below upward and backward. In this way, after the excision has been made the cut surface is entirely on the posterior aspect of the organ. The result is that in swallowing food and liquids the raw surface applies itself closely to the pharyngeal wall and is less liable to be irritated by the ingesta. This point I regard as one of exceeding importance, and, as will easily be perceived, this peculiar line of division is not secured by the uvulotome or the claw scissors. In most instances it is necessary to depress the tongue by means of the spatula. This instrument is easily held in the right hand while the thumb and second finger of the right hand are inserted in the rings of the scissors. As soon as the tip of the uvula has been properly seized by the forceps, the spatula is dropped and the scissors brought into play. After the organ has been amputated it is important to direct the patient to take no food for the remainder of the day containing salt, vinegar, pepper, or other irritating substance, and in addition to carry a small piece of gum arabic or elm bark in the mouth. In case of children, gum drops or fresh marsh mallows answer an equally good purpose.

If the measures above stated are properly carried out, I think in the very large majority of instances the pain and discomfort which so frequently attend uvulotomy may be avoided.

If the organ is unnecessarily mutilated in amputation, the patient will suffer with a severe sore throat for days. If this occurs, the only thing that can be done is to make use of mild astringents and sedatives such as cocaine, morphine, etc., locally applied. I think, however, that in the majority of cases, if the operation is properly done, the discomfort which follows it need not last for more than from twelve to twenty-four hours.

HEMORRHAGE AFTER UVULOTOMY.—Uvulotomy is to be regarded as an exceedingly simple operation and one practically unattended with danger; and yet Morgan,[1] in reporting a case of dangerous hemorrhage following the operation, has made a most exhaustive study of the subject, and has shown that its sequelæ may be not only dangerous but even fatal.

Spagnola[2] reports a case occurring in Zambaco's practice in

[1] Trans. Amer. Laryng. Ass'n, 1886, p. 80.

[2] Union méd. d'Orient, Constantinople, 1880, No. 24. Schmidt's Jahrbuch, 1880, vol. clxxxvii., p. 173.

which severe hemorrhage followed four hours after uvulotomy. This was controlled by perchloride of iron. Several recurrences took place, and the patient passed into other hands. His subsequent history is somewhat obscure; he seems to have died, however, on the eighth day, having had colicky pains, bloody stools, and diarrhœa. This patient wore false teeth, and Spagnola seemed to think that the involuntary movements of the mouth and throat at night when the plate was removed may have kept up the hemorrhage. A far more plausible suggestion, it seems to me, is that this patient died from concurrent disease, probably gastric ulcer.

In the ancient Iceland records,[1] there is found the brief statement that a nobleman on his way to Rome died in England from hemorrhage following uvulotomy (secta uvula). The date of this occurrence was A.D. 1035. It is needless to say that the surgery of that day was somewhat primitive.

Tompkins[2] reports a case of uvulotomy in which, though followed by no hemorrhage, the patient suddenly dropped dead a few minutes later. There was no autopsy, but the cause of death was supposed to have been cardiac disease.

While then I think that we are safe in saying that there is no well-authenticated case of death following uvulotomy, a number of cases of troublesome and even dangerous hemorrhage have been reported by Malgaigne,[3] Guéneau de Mussy,[4] Fournié,[5] and Catuffe,[6] while in personal letters to Dr. Morgan[7] instances of this accident have been recorded by Mackenzie, Semon, Delavan, Hartman, Labus, Rankin, White, Brallier, Carpenter, Baratoux, and Roe.

Malgaigne's case was primary, and, astringents, ice, and nitrate of silver failing, the bleeding was finally arrested by nitrate of silver while the stump was held with the forceps.

In Mussy's case the source of the bleeding was in a spurting artery and was finally controlled by the actual cautery after the failure of compression and other remedies.

Fournié's case was controlled by forceps held in position twenty minutes.

In Catuffe's case the hemorrhage was temporarily arrested by hot-water gargles and other measures, but was permanently arrested only by the use of forceps.

In Mackenzie's case the bleeding lasted nine hours, and ceased spontaneously after hirty-two ounces of blood had been lost.

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[1] Personal letter of Wilhelm Meyer to Dr. Morgan.
[2] Med. Record, New York, 1886, vol. xxix., p. 706.
[3] Revue méd. chir., Paris, 1847, vol. ii., p. 340.
[4] "Traité de l'Angine glanduleuse," Paris, 1857, pp. 75 and 76.
[5] Revue méd. Franç. et Étrang., 1884, vol. i., p. 437.
[6] La France Méd., 1889, vol. i., p. 13.
[7] Loc. cit.

In Semon's case the bleeding lasted fifteen hours, and ceased spontaneously.

The hemorrhage in Delavan's case was primary, lasting four hours, and was controlled by nitrate of silver.

Hartman saw two cases, in one of which the bleeding lasted all day, and was controlled by the galvano-cautery. In his second case the bleeding persisted for three hours, and was arrested by sulphate of iron.

Labus also saw two cases. In one case the bleeding lasted the greater part of two days, and was finally arrested by the galvano-cautery. In his second case the bleeding lasted three days, and finally ceased spontaneously.

In a case seen by Rankin the hemorrhage persisted for thirty hours and was arrested by persulphate of iron. In a second case the hemorrhage came on twenty-two hours after the operation and continued for a day, and was finally checked by a gargle of hot water.

In White's case the hemorrhage came on two hours after the operation, and at the end of another two hours syncope occurred, whereupon the bleeding ceased and did not recur.

In a case observed by Brallier the bleeding lasted sixteen hours, and was only controlled by the forceps and cautery.

In Carpenter's case the bleeding lasted twenty-four hours, and was finally controlled by styptics and ice.

Baratoux has seen three cases. In the first the bleeding lasted a half-hour, and was arrested by chloride of zinc. In his second case it lasted three hours, and was checked by chloride of zinc in connection with the forceps. In the third case he resorted to the use of the cautery.

In a case which is reported by Roe the bleeding was arrested by the use of stout dressing forceps kept in position for three hours.

It is not easy to understand how hemorrhage from uvulotomy can be troublesome or difficult to control if the operation has been done at the proper point, viz., at a distance of three-eighths to half an inch below the border of the palate. In the cases above reported the point of section is not stated in most instances.

In one of Rankin's and in Carpenter's cases the whole organ was removed. In each instance the hemorrhage persisted for twenty-four hours. In those cases where it is stated that only a portion of the organ was removed the hemorrhage was as a rule readily controlled.

Morgan's case[1] is one of the most interesting reported. In this

[1] Loc. cit.

instance the patient consulted Morgan six days after the operation, with a history of recurrent attacks of hemorrhage lasting five days. The whole uvula had been removed. The hemorrhage was temporarily arrested by the galvano-cautery, chromic acid, and other remedies, but recurred each time, until finally a small spring clamp such as is used on garters and suspenders was placed on the stump and allowed to remain several hours, and the bleeding was finally arrested thereby, after having persisted six days.

The above review of cases pretty clearly shows, I think, the indications and methods of controlling hemorrhage in case such an accident follows uvulotomy, and that, while the ordinary hæmostatics are not to be depended upon, our most reliable resort in any case will be in the use of a clamp applied to the stump.

The little instrument which Morgan used is certainly a most ingenious device, and answers the purpose probably as well as anything that might be constructed. He has devised an instrument on the principle of the serre-fine for use in these cases.

It would seem that hemorrhage might be avoided by performing the amputation with the snare; and yet in one of Baratoux's cases this instrument was used for operating. Morgan[2] advises the snare, on the ground that a better stump will be left. I am disposed to think, however, that the bruising of the tissues which accompanies the use of this instrument would give rise to a rather distressing sore throat.

While a serious objection to the complete removal of the uvula lies in the danger of hemorrhage, Shurley[3] makes a still further point that one of the functions of this organ lies in supporting the palate during phonation by resting upon the base of the tongue: this support, therefore, is abolished in its complete removal, resulting in an additional labor and consequent fatigue to the palatal muscles in the use of the voice.

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[1] Trans. Amer. Laryng. Ass'n, 1887, p. 246.

[2] Maryland Med. Jour., 1885, vol. xiii., p. 423.

[3] Detroit Lancet, 1880, vol. iv., p. 295.

CHAPTER X.

QUINSY OR PERITONSILLAR ABSCESS.

THE term quinsy is merely a corruption of the term *cynanche*, so extensively used in older medical literature to designate the various diseased conditions of the fauces which were characterized by an angina or obstruction of the parts. The word is derived from the two Greek words *kuon* and *agcho*, translated by Dunglison "dog choke." In later literature the disease has usually been described under the designation of acute tonsillitis. This, however, I regard as an erroneous term, in that the disease is not properly an inflammation of the tonsillar tissues, but involves rather the areolar tissue surrounding the tonsil. The term quinsy is retained on account of its very general adoption and usage in literature.

We may define a quinsy as an active, acute inflammation of the tissues immediately surrounding one or the other of the faucial tonsils, which rapidly assumes a phlegmonous character, and results usually in the development of a suppurative process or abscess. In the large majority of cases the morbid process locates itself in the soft tissues immediately in front of the tonsil, and involves the soft palate. In other instances we find it developing behind the tonsil, and extending backward and downward, resulting in the formation of an abscess in the lateral walls of the lower pharynx. In still rarer instances the morbid process seems to start in the tissues immediately beneath the tonsil, giving rise to a suppurative process, which results in the formation of an abscess in this region, the pus making its escape directly through the deep layer of the tonsil into one of its crypts, and finally escaping on the surface of the organ itself. The point upon which it is desired to lay special emphasis in this connection is that this phlegmonous inflammation does not take place in the tonsil, but rather in the peritonsillar areolar tissue. During the course of the morbid process, however the tonsil itself becomes somewhat involved in the inflammatory action, and is also elevated or crowded out from its bed in such a way as to give rise to the impression that the tonsil is the seat of disease. Hence, as before stated, the name acute tonsillitis is often given to it.

The tissues which go to make up the tonsil in a state of hypertrophy, in the main, are of a lymphatic character, with a certain number of secreting glands. Now, from a clinical point of view, we do not meet with suppurative inflammation in tissues of this character, whereas the cellular tissues present the natural habitat, as it were, for a suppurative process. Hence I think there should be no question as to the view expressed, that the starting-point of a quinsy is in the peritonsillar areolar tissue, and that, while the tonsil itself is involved in the inflammatory process, this is largely the accident of its contiguity, although it should be stated that we regard the existence of an enlarged tonsil as a somewhat active predisposing cause of the attack.

ETIOLOGY.—This affection belongs essentially to the middle period of life, in that in infancy and childhood it is exceedingly rare, while in the later years of life any tendency to its occurrence seems to wear itself out or disappear. It may occur, however, at any age. Thus, Reid[1] reports a case occurring in a child seven months of age, while Falls[2] observed the affection in a child nine months of age, Kattefield[3] has seen one in a child of eleven and three-quarters months, and Clark[4] reports one in a child aged fourteen months. Of 133 cases of which I have records in my private practice, there were, under ten years, 3; between ten and twenty years, 30; twenty to thirty years, 61; thirty to forty, 11; and over forty, there were 12; the oldest case occurring at the age of sixty-nine, while the youngest was nine months.

These statistics do not differ essentially from those given by Mackenzie,[5] as seen in the London Throat Hospital, as follows:

Under 10 years,	35
10 to 15 "	36
15 " 20 "	184
20 " 25 "	323
25 " 30 "	219
30 " 40 "	143
40 " 50 "	51
50 " 60 "	9

That it should occur far more frequently in males than in females is easily understood, in that its common exciting cause is taking cold, to which men are necessarily much more exposed. Thus, in my 133 cases 88 were males, while but 45 were females.

[1] Arch. of Laryngol., 1880, vol. i., p. 227.
[2] Eastern Med. Journ., 1887, vol. ii., p. 45.
[3] Deutsch. med. Woch., 1886, vol. xii., p. 484.
[4] New York Med. Journ., 1890, vol. xli., p. 456.
[5] "Diseases of the Throat and Nose," American edition, 1880, vol. i., p. 63.

The season has a very marked influence upon its development, for the same reason, viz., that, resulting from exposure to cold, it is far more likely to occur during the spring and fall months, when all diseases which follow exposure are more prevalent. Mackenzie gives us still further light on the subject, by the following rather interesting table of 1,176 cases, which were seen at the London Throat Hospital:

In January,	86
" February,	70
" March,	64
" April,	59
" May,	77
" June,	69
" July,	111
" August,	107
" September,	205
" October,	178
" November,	101
" December,	49

We should find it difficult to harmonize this table with our clinical observations in America, without taking into consideration, as Mackenzie does, the fact that probably patients suffering from quinsy are more apt to venture out in the warm months of summer and fall than during the winter. It should be stated that these tables are given as cases of tonsillitis. It is possible that some instances are recorded here which were not of the suppurative variety.

It seems to be an hereditary disease, and run in families. This is a matter of almost universal observation.

It occurs rather in the lower walks of life, and among those compelled to live an outdoor life and labor in the open air or in places where they are subjected to exposure.

We know of no exciting cause of the attack, other than an exposure to cold. Our interest, however, in the clinical history of the disease lies more largely in the active predisposing causes, and of these we must undoubtedly place first and above all the rheumatic habit. Indeed, I am disposed to make the assertion that a suppurative inflammation in the cellular tissue surrounding the faucial tonsil, in probably nine cases out of ten, should be regarded as a manifestation of rheumatism. This idea is by no means a new one, for while it has not received definite expression in the older literature of throat diseases, the reputation which the preparations of guaiac have obtained for the treatment of this affection, in long

years past, must be accepted as a recognition of the systemic character of the disease, although it would seem that this drug was used somewhat empirically. As far as I know, the earliest writer to insist upon the definitely rheumatic character of quinsy was Lennox Browne.[1]

This view was subsequently indorsed and somewhat elaborated by Fowler,[2] Fitzmaurice,[3] and Knox.[4]

The last observer sustains his views by the report of a study of 50 cases, in 45 of which a distinct history of rheumatism was found. Mackenzie[5] and Sajous,[6] I think, fail to attach sufficient importance to the rheumatic character of the disease, referring to this element of causation somewhat casually.

That the existence of enlarged tonsils undoubtedly acts to invite the phlegmonous inflammation to the surrounding tissues is a matter of very frequent clinical observation. This influence, however, is exerted somewhat indirectly, in that the hypertrophied tonsil is usually the seat of a mild subacute inflammation, or, if this is not present, it is liable to recurrent attacks of mild inflammatory action, under which the graver disease is invited. In other words, I do not regard an inert hypertrophied tonsil as so actively predisposing to quinsy as the subacute tonsillitis which not infrequently occurs in the organ.

An attack of acute follicular tonsillitis also very frequently precedes the phlegmonous inflammation, the active morbid process, which characterizes this disease, seeming to set up the suppurative inflammation, though in these cases I think we must recognize a particular predisposing cause in a rheumatic habit, or some other general dyscrasia, in that an acute follicular tonsillitis does not, and cannot, develop a quinsy, without some particular predisposing cause. In the same manner we not infrequently see an attack of scarlet fever or measles, or other of the exanthemata, give rise to an attack of quinsy. Demme[7] assigns this tendency to the convalescent stage of the exanthems, and explains it, somewhat vaguely, on the theory that the convalescent stage favors the development of new foci of infection. Mahomed,[8] in an examination of 3,957 consecutive cases of scarlatina, observed, after an apparent convalescence, the occurrence of a secondary faucial inflammation, in

[1] "The Throat and its Diseases," first edition, London, 1878, p. 171.
[2] Lancet, London, December 11th, 1880.
[3] British Medical Journal, 1886, vol. i., p. 67.
[4] Chicago Medical Journal and Examiner, 1886, vol. lii., p. 208.
[5] Op. cit., p. 64.
[6] "Diseases of the Nose and Throat," Philadelphia, 1886, p. 281.
[7] Schmidt's Jahrbücher, 1883.
[8] Lancet, London, 1882, vol. ii., p. 775.

some cases resulting in suppuration, which will perhaps serve to throw light on Demme's statement, and also indicate the rarity with which the exanthemata lead to the development of quinsy.

In addition to the above, there are undoubtedly many cases which apparently develop spontaneously; certainly we are unable to find anything in their clinical history which warrants us in attributing any specific cause to the attack. We may simply say that impaired general health, irregularity of life, vicious hygienic surroundings, and other causes of this nature exert an influence in predisposing to the disease. The main point of interest, however, with regard to the etiology of phlegmonous peritonsillitis lies in the recognition of the rheumatic habit as a contributing cause in the very large majority of cases.

PATHOLOGY.—The special pathological process which characterizes the development and progress of an attack of quinsy presents no especial features, as far as we know, which differ in any notable degree from the ordinary suppurative processes which are met with as occurring in the cellular tissue of any portion of the body. As the result of some irritant, the cellular tissue beneath or in the neighborhood of the tonsil becomes the seat of a localized inflammatory process, characterized by the ordinary phenomena of inflammation. The active cause of this, we may say, lies in an exposure to cold, while its predisposing cause, in the majority of cases, lies in the rheumatic dyscrasia. Under the influence of these agents, this deep-seated inflammation rapidly assumes an unusual activity, which, as is the ordinary rule, rapidly degenerates into a suppurative process. This formation having once been established, primarily by the rapid escape of the white corpuscles from the blood, is continued by the gradual involvement of the neighboring tissue in the morbid process in such a manner that the connective-tissue cells, lymph bodies, and other elements of the normal tissue break down and degenerate into pus-corpuscles. By this latter process, undoubtedly, the abscess makes its way gradually toward the surface, where it is finally discharged spontaneously, unless surgical interference has hastened or arrested the morbid action. In connection with the phlegmon, there occurs marked infiltration of the surrounding tissues, resulting in a certain amount of œdema in those portions of the surface mucous membrane which are most loosely attached to the parts beneath. This may confine itself to the uvula and soft palate, or may also extend and develop in the softer tissues in the larynx, notably the ary-epiglottic folds, and the arytenoids, thus giving rise to œdema of the glottis. In a very large majority of cases, a quinsy confines itself to one side of the fauces, although a double quinsy is by no means an infrequent

occurrence. The primary seat of the phlegmon is usually in the cellular tissue immediately above the upper border of the tonsil, in which case the tumefaction extends, not only beneath the tonsil, but into the tissues of the soft palate, the centre of induration, after the phlegmon is fully developed, usually pointing nearly midway between the upper border of the tonsil and the side of the uvula, at its base (see Fig. 14). In other instances we find the centre of phlegmon developing apparently in the cellular tissues, at the lower and posterior border of the tonsil, the inflammation in this case extending backward and downward, giving rise to a somewhat elongated or spindle-shaped phlegmon, which extends down the posterior wall of the pharynx, along its lateral border. This may reach as far as the orifice of the œsophagus. In this case

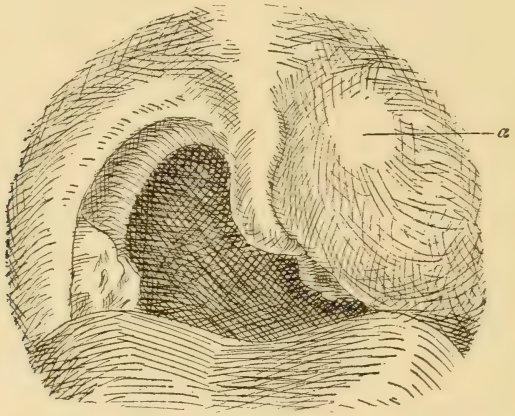

FIG. 14.—The Palatal Form of Quinsy. *a*, The point of selection for incision.

the phlegmon usually tends to point as low down as the level of the epiglottis, or even below it. Another locality in which the phlegmon may develop is in the tissues immediately beneath the tonsil. In this case the tonsil is lifted bodily from its bed, while the centre of suppuration develops in the structures beneath the tonsil, the escape of pus being usually into one of its crypts. In other instances we find the inflammatory process showing its greatest activity in the posterior pillars of the fauces, giving rise to a somewhat elongated phlegmon, which, however, usually extends no farther than the base of the tongue. Fitzmaurice[1] has reported what must be necessarily an exceedingly rare development of quinsy, in that, whereas the inflammatory process had its origin in the peritonsillar tissues, there resulted an acute glossitis, which required incision. In a paper published some years since[2] I reported

[1] British Med. Jour., 1885, vol. ii., p. 1,659.

[2] "The Three Tonsils," etc., N. Y. Med. Record, Oct. 4th, 1884.

analyses of 133 cases of quinsy, in which the phlegmon occurred in the soft palate in 115 cases, in one or the other of the posterior pillars of the fauces in 11 cases, while in 2 the abscess developed beneath the tonsil, and discharged upon its surface through one of its crypts, and in 2 cases the posterior wall of the pharynx was involved.

The suppurative process in these cases usually expends itself in developing an abscess, which tends somewhat to extend in all directions from its original starting-point. Thus, when it forms in the soft palate, it confines itself mainly to the soft palate or pillars of the fauces. This may be due to an inherent tendency in the morbid process, or possibly to the fact that the pus makes its way to the surface and escapes before the pressure becomes great enough to cause it to burrow. That this is not always true, however, is shown in the unique case reported by Velpeau and Béraud,[1] in which the pus from a tonsillar abscess made its way into the cellular tissues of the neck as low down as the level of the clavicle. A somewhat similar case is also reported by Kiemann,[2] in which, in addition to making its appearance in the cellular tissue of the neck, the abscess gave rise to a purulent pleurisy and symptoms of pyæmia, with metastatic abscesses in the lower lobes of both lungs. Reid[3] also reports a somewhat similar case, although in this instance the pus burrowed along the course of the great vessels, through the mediastinum, and into the pleural cavity of the left side, giving rise to a purulent pleurisy. Death occurred about the seventh day after the onset of the attack. Reid reports this as a case of suppurative tonsillitis. The question of course arises, in connection with these two latter cases and probably with all three, whether the disease may not have been acute infectious phlegmon, although in the latter disease we meet with suppurative inflammation rather than abscess formation.

As a complicating pathological lesion, a number of cases have been observed where thrombosis occurred in the neighboring veins, in connection with pyæmia. Such instances have been reported by Montague,[4] Rigal[5] Blachez,[6] and Didelot,[7] although a careful study of the history of the last case would seem to indicate that it was one of acute infectious phlegmon.

SYMPTOMATOLOGY.—The attack is usually ushered in by a fully developed chill, or in rarer instances by well-marked chilly sen-

[1] Manuel d'Anat. chirurg., Paris, 1862

[2] Wien. med. Presse, 1882, vol. xxiii., p. 1,520

[3] Med. and Surg. Reporter, Phila., 1888, vol. lix., p. 387.

[4] "Dissert. de Angina Tonsillari," etc., Strasbourg, 1823.

[5] Cited by Breton, Thése de Paris, 1883.

[6] Gazette Hebdom., 1862, p. 105.

[7] Thése de Paris, 1850.

sations. This is followed soon by all the evidences of general febrile disturbance, such as pains in the bones, headache, loss of appetite, general malaise, etc., the headache not infrequently being of an unusually severe type, far more so than is usually met with in connection with febrile movement. This may possibly be explained by the rheumatic element in the disease. The temperature usually, at the onset of the attack, reaches as high as 102½° to 103°, while in rare instances it has been known to attain as great an elevation as 105°. According to Lennox Browne,[1] constipation invariably precedes and attends the progress of the disease. This I have noticed in a number of instances, although I should scarcely regard it as an invariable symptom.

Following upon these symptoms almost immediately there is experienced a feeling of deep-seated discomfort in the fauces, referable usually to one side. This soon develops into a distinct pain, of a gnawing or boring character, which is constantly present, without reference to the movements of the fauces, although notably aggravated by deglutition. This pain may persist for twenty-four to thirty-six hours, perhaps, before evidences of tumefaction set in, although usually the swelling occurs almost immediately. As this latter symptom develops, the pain becomes more severe and assumes a sharp and lancinating character, while deglutition becomes not only painful but difficult, on account of the mechanical obstruction which the swollen tissues present. The localized swelling now develops somewhat rapidly, and the normal lumen of the fauces becomes notably encroached upon. Usually, at the end of twenty-four to thirty-six hours, the swelling has assumed such a character that deglutition becomes almost impossible. The local inflammation not only gives rise to a tumefaction, but also causes an infiltration of the muscles of the soft palate and pharynx, as the result of which their contractility is to a large extent destroyed. Hence the swallowing of solid food becomes an impossibility, and the swallowing of liquids is accomplished only with the greatest difficulty. In addition to this, the mucous membrane covering the parts also becomes infiltrated, and the soft palate, and especially the uvula, become the seat of a certain amount of œdema, thus opposing an additional obstruction to the effort of deglutition. At the end of twenty-four to thirty-six hours usually, the sharp, lancinating character of the pain has disappeared to a certain extent, and in its place there sets in a deep, throbbing, boring pain, which at times is almost unbearable. It is usually referable to the faucial region, though it courses up toward the ear, and is not infrequently referred to that organ. This pain is probably of a neuralgic character, although possibly

[1] "The Throat and its Diseases," 2d ed., Lond., 1887, p. 229.

aggravated by the fact that the pharyngeal orifice of the Eustachian tube is usually either pressed upon by the tumefaction, or closed by the swollen mucous membrane which results from it, thus giving rise to impairment of hearing, and not infrequently to tinnitus, or noises in the ear. As the result of the localized tumefaction the whole mucous membrane of the fauces is involved to a certain extent in a catarrhal inflammation, with a notable hypersecretion of mucus. This mucus accumulates in the fauces and lodges upon the parts, the patient being unable to expel it by any voluntary effort, owing to the semi-paralyzed condition of the faucial muscles. The voice is notably and characteristically affected. It is thick and muffled, and articulation is especially hampered, so that, whereas phonation is usually fairly clear, the vocal waves are smothered, by the presence of the tumefaction above the orifice of the larynx. The accumulation of thick and tenacious mucus in the fauces becomes the source of so much annoyance that the patient makes frequent efforts to clear the passages, by an attempt at hawking, which is quite characteristic, in that the sodden condition of the muscles renders the effort somewhat futile. Normal nasal respiration is interfered with, not only by the obstruction which the tumefaction presents to the posterior nares, but also by the involvement of the nasal mucous membrane, by sympathy perhaps, in the inflammatory process. As a consequence of this, the sense of smell and the sense of taste are to a large extent abolished. The patient, at this stage of the disease, presents a picture of distress, which is not only characteristic, but most pitiable. He sits with his body bent forward, avoiding any movements of the neck, as aggravating his pain, while the head is inclined forward, to allow the saliva to drop from the mouth. An increase of this secretion is naturally caused by the presence of the phlegmon, while the patient necessarily allows it to escape from the mouth, in that its deglutition is rendered almost impossible. Sleep is abolished, as the result of the constant pain, and the patient declines all food and drink in consequence of the suffering which the effort at deglutition entails. Indeed, the whole aspect of a case of quinsy, when the phlegmon is fully developed in the fauces, with the expression of pain and suffering on the face, the heavy and sleepless eyes, and open mouth with the dripping saliva, present a picture of misery which is most striking and characteristic.

The symptoms above described are usually met with in connection with that form of quinsy which develops in the soft palate and confines itself to one side. The symptoms, as we see, are largely due to the existence of acute phlegmonous inflammation in

the fauces. In other words, they give rise to localized pain, and interference with the normal functional movements of the parts.

Where the quinsy develops on both sides, we simply meet with an aggravation of all the symptoms detailed above, with the addition that, as the result of the encroachment of the tumefaction on either side of the fauces, not only deglutition, but respiration may be interfered with, in that the tumor, springing from either side, is liable to meet its fellow in the median line, while at the same time, it protrudes backward in such a manner as to cut off the current of air passing through the nose. While in adults this interference with respiration is not always a prominent symptom, in young people the danger of suffocation in double quinsy is by no means a remote one. Where the tumor develops in one of the posterior pillars of the fauces, or in the lateral wall of the lower pharynx, it does not assume such large proportions, as a rule, as when it occurs in the soft palate. This is easily accounted for, on account of the denser and less yielding tissues which are involved in the phlegmonous inflammation. The pain, however, here is usually quite as severe, if not more aggravated in character, as is also the mechanical interference with deglutition, which is only accomplished with the greatest possible effort, or may be prevented even entirely. Furthermore, the duration of the disease here is much longer than where it is met with in the softer tissues above. This is probably due to the fact that, while suppuration occurs quite as early in one region as the other, the abscess makes its way much more slowly to the surface through the denser tissues of the pharynx than through the soft tissues of the palate. The long fusiform phlegmon which characterizes a quinsy in the lateral wall of the lower pharynx, may extend down, as before stated, as far as the orifice of the œsophagus, but it may assume such proportions as to crowd upon the lateral wall of the larynx in such a way as to produce a distressing dyspnœa. Of three cases of this form of quinsy which have come under my own personal observation, in one of them this latter accident occurred to such an extent that tracheotomy had become almost imperative, when I finally succeeded in evacuating the pus a few lines above the orifice of the œsophagus. The dyspnœa in this case was not due to any secondary involvement of the larynx by œdematous swelling, but purely to the mechanical pressure of the phlegmon.

A quinsy developing in the lower pharynx is, as far as my experience extends, unilateral, nor do I know of a case of double quinsy in this region having been reported. That it may occur, however, is altogether probable.

Where the phlegmon develops in one of the posterior pillars of

the fauces, it does not usually assume large proportions; hence the symptoms are mainly those of severe pain in deglutition, together with a certain amount of interference with respiration, the encroachment upon the lumen of the fauces not being by any means as great as that which occurs in connection with the palatal form of quinsy. The pain, however, is usually very severe, and the sufferings of the patient, as long as it lasts, are exceedingly distressing.

As evidence of the relation of this disease to rhemuatism, Fox[1] reports a case in which a quinsy developed ten days after an attack of acute articular rheumatism; while Easby[2] reports a case in which acute articular rheumatism, affecting all the joints, developed on the fourth day after the subsidence of an attack of quinsy. A similar case was reported by Fitzmaurice.[3]

DIAGNOSIS.—At the onset of the attack, there is nothing in the local appearances which renders it possbile to make a diagnosis by mere ocular inspection. When, however, a patient is subject to attacks of quinsy, he recognizes the peculiar and characteristic sensations in the throat, as usually premonitory of the disease, and hence, in these cases, the diagnosis is usually made by the patient himself. At the end of from twelve to twenty-four hours, however, the local appearances are such as to render the diagnosis comparatively easy. On inspection, it will be seen that the parts present all the characteristic appearances of an active acute phlegmonous inflammation. The prominent feature which indicates this is the swelling, which is easily recognized, distorting the fauces, and impairing its usually symmetrical appearance. The tonsil itself is the seat of a mild inflammation, as evidenced by redness and hyperæmia, while it is pressed forward and inward by the swelling beneath it. The activity of the inflammatory process, however, is evidenced by the appearance of the soft palate or the parts immediately above the tonsil. This presents a swollen appearance, while its color is of a distinctively bright red tinge, slightly verging on a purplish hue. This, of course, is with reference to the most frequent form of quinsy, which involves the cellular tissue of the soft palate.

The most important information, however, is obtained by palpation, and this is a means of diagnosis which should always be resorted to, as affording us the best and surest information. This is accomplished usually with the right fore-finger, which is inserted well into the mouth, and first one and then the other side of the

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[1] British Med. Journ., 1886, vol. i., p. 167.
[2] Ibid. [3] Loc. cit.

fauces examined. This should be done delicately, but with sufficient persistence to elicit the fact of the existence of a tumefaction, as well as the extent of it. By this measure, the existence of the swelling, as well as the presence of pus, if such has developed, is easily detected, the mass being felt under the tip of the finger, as the hard, dense, and slightly elastic tumor, which we recognize as belonging to a phlegmonous process.

In those somewhat rare instances where the activity of the inflammatory process develops in the posterior pillar or in the lateral wall of the lower pharynx, the diagnosis must be made mainly by ocular inspection. This should always be done, as in the former case, with a thoroughly good illumination, the tongue being pressed downward and forward, slowly and firmly, by means of the spatula, and with such care as to secure a proper view of the parts at rest, or without causing retching. The pharynx being fully exposed, the long fusiform swelling will show itself, lying in the one case in the posterior pillar of the fauces, in the other in the lateral wall of the pharynx, showing the presence, by unmistakable evidence, of an acute inflammatory process, the tumefaction projecting forward into the faucial region with sufficient prominence to render its presence easily recognized. In this region, also, it is occasionally feasible to examine the parts by means of the index-finger; and where this is tolerated it should always be done, as affording additional evidence, not only of the presence of the phlegmon, but also of the progress which it has made toward suppuration. This, I think, is imperative in all cases; for whereas the character, size and location of the tumefaction can always be recognized by inspection, its progress can only be determined by palpation. This is not especially painful, if done delicately, and is easily tolerated by the patient. Furthermore, the sensitiveness of the region can be determined in this way, by moving the fore-finger carefully over the parts. The main importance, however, of this manipulation is in determining whether suppuration has set in, and, if so, the place where the abscess tends to "point."

A certain amount of importance is attached, in the general literature on the subject of quinsy, to the necessity of a differential diagnosis between this disease and the faucial manifestations of the exanthemata, diphtheria, acute follicular tonsillitis, fibrous tumors, malignant disease, aneurism, and gangrenous tonsillitis, or syphilitic disease of the pharynx. It would scarcely seem probable that any of these diseases could be confused with an attack of quinsy, certainly a mistake could scarcely occur, if the parts are examined with sufficient care and with the thorough illumination of the region which the diagnosis demands. As regards diphtheria

and follicular tonsillitis, the existence of an exudation should eliminate the question of quinsy. As regards syphilitic disease, the only form of this which could contribute to an error in diagnosis would be the tertiary ulcer, the inflammatory areola of which, with its swollen membrane, may present something the appearance of phlegmonous inflammation. The existence, however, of the ulcerated surface should, with careful examination, be determined. Ulceration, of course, never occurs with quinsy. S. S. Cohen reports a somewhat curious case in which a quinsy, in a patient eighty years of age, left behind it a somewhat unusual condition resembling an ulcerative process in the tonsil, which he at first suspected might be an epithelioma, seeing the case four weeks after the attack. These appearances, however, disappeared, and the patient made a perfect recovery. The difficulty in diagnosis, however, here was not during the activity of the disease, but only after the acute inflammatory process had subsided.

In the faucial manifestations of the exanthemata, the local inflammatory process does not develop in a phlegmonous form; hence these conditions need not be a source of error in diagnosis.

As regards fibrous tumors of the fauces, the absence of inflammatory changes in the surrounding mucous membrane, together with the clinical history of the case, the characteristic feeling of the tumor, in its density and nodular outline, should rarely lead to a mistake of diagnosis, yet in a case reported by Natier[2] a peritonsillar phlegmon presented so much the appearance of a fibroma as to render the diagnosis for some time rather doubtful. A differential diagnosis between a quinsy and an aneurism would seem to be a comparatively easy matter, and yet in this connection the following case reported by Duke[3] is both interesting and instructive: A man, beyond middle life, received an injury which gave rise at the time to a somewhat slight feeling of discomfort about the fauces. A year later the local symptoms, becoming more aggravated, Duke made a digital exploration of the tumefaction in the fauces, in the region of the tonsil, and, detecting pulsation, made a diagnosis of aneurism. A *confrère*, seeing the patient later on the same day, concluding that the disease was a quinsy, plunged a bistoury into it, with the result of bringing on hemorrhage from an aneurismal tumor. Duke, being sent for hurriedly, arrived in time to ligate the carotid artery, with the result of saving the patient's life for the time, although twenty-eight days later secondary hemorrhage set in, which proved fatal.

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[1] Medical News, Philadelphia, 1884, vol. lxiv., p. 186.

[2] Ann. de la Polyclin. de Bordeaux, 1889, vol. iv.

[3] Lancet, London, 1848, vol. i., p. 243.

As regards gangrenous tonsillitis, this is usually a superficial process, and not attended with any notable tumefaction of the parts; however, gross inspection ought in all cases to make clear the character of such a pathological process.

In brief, I think that the gross appearances of quinsy, together with its clinical history, the typical aspect of the case, the peculiar sharp jerky motion in the attempt at deglutition, caused by the pain in swallowing, the motionless pose of the head, the typical aspect of the face, and indeed every appearance, general and local, are such as to render a diagnosis in most cases a comparatively easy matter.

It should be stated, perhaps, that there may arise a somewhat important question of differential diagnosis, as between a quinsy and diphtheria, in the very early stages of either attack. Here we shall be compelled to depend upon the lower febrile movement, the asthenic type of the disease, the enlargement of the cervical glands, the existence of albumin in the urine, the absence of marked localized pain in the fauces, and indeed the general aspect of the case, as indicating diphtheria on the one hand, while in the other case we have, as a rule, no enlargement of the cervical glands, practically no albuminuria, a sthenic type of disease, together with notable local symptoms, such as pain on deglutition, etc., indicating quinsy. As far as the local appearances are concerned, however, at their onset, I know of no method of absolutely determining the question of diagnosis, other than the appearance of the characteristic membrane in the one case, and its absence in the other, in connection with the well-developed phlegmonous inflammatory process.

Course and Prognosis.—A quinsy usually runs its course in from five to ten days, according to its location and the measures of treatment which have been resorted to to curtail or arrest its progress. Its course is not ordinarily attended with any especial danger to life, although it entails very great suffering to the patient. Its progress results in the development of a suppurative process in the centre of the phlegmon, which makes its way to the surface and escapes. After the pus has discharged, the active inflammatory symptoms disappear rapidly, and convalescence is practically established when the abscess discharges, any prominent symptoms due to the local morbid condition disappearing at the end of twelve or, at the utmost, twenty-four hours after the abscess has been evacuated.

As a rule, I am disposed to think that we may anticipate the formation of pus at the end of the second or by the third day. Those cases which are long protracted ones, as when, for instance, a

quinsy persists for ten days or two weeks, I think are due, not to the fact of a delayed suppuration, but to the fact that the abscess forms in dense tissue, and makes its way slowly to the surface. This is characteristic of those abscesses which develop in the pharyngeal wall, and, in a less degree, of those which develop in the posterior pillar of the fauces. The quinsy which runs its course most rapidly is that which forms in the tissues of the soft palate. The point of selection for superficial necrosis, or "pointing" as it is usually called, in the palatal abscess, is about midway between the upper border of the soft palate and the side of the uvula (see Fig. 14). Where, however, we meet with a long fusiform phlegmon in the posterior pillar of the fauces or in the lateral walls of the lower pharynx, the abscess generally "points" in the more dependent portion of the tumefaction.

While, as we have stated, a quinsy is not considered a grave disease, and involves no serious and direct dangers to life, in its regular progress, cases of death occasionally occur, as the result of untoward accidents or rare complications. Perhaps the most frequent accident met with is where the evacuation, having been long delayed (in consequence of which the pus cavity has attained somewhat large proportions), spontaneous rupture occurs during the night, and the pus makes its way into the air passages, causing death by asphyxia. Cases of this kind have been reported by Montague,[1] Way,[2] and others. Allusion has already been made, in the discussion of the pathology of the disease, to the cases of Rigal, Blachez, Kiemann, and Didelot, in which pyæmia set in, followed by death. In the first three of these cases, after spontaneous evacuation of the peritonsillar abscess, pyæmia supervened, as evidenced by metastatic abscesses, thrombosis, etc., and the patient eventually succumbed; while, in the last, pyæmia developed without the formation of an abscess in the fauces, and death ensued. This case, however, we have heretofore referred to as being possibly one of acute infectious phlegmon. The same question, of course, arises with reference to the first three cases. Pyæmia, certainly, is not a danger which we ordinarily anticipate in connection with a simple quinsy. Undoubtedly, in the above cases, the septic infection had occurred before the abscess in the fauces evacuated itself. There would certainly seem to have been present in these cases, some exceedingly virulent condition, possibly of an infectious character, which led to the development of the pyæmia. If this was present at the onset of the attack, the cases were undoubtedly instances of acute infectious phlegmon; if it developed during the progress of the quinsy, it compels us to

[1] Loc. cit. [2] New York Medical Record, 1888, vol. xxxiii., p. 215.

recognize the presence in this disease of the possibility of an exceedingly grave complication. I am disposed to think that the probability leans decidedly toward the former supposition, and that these were cases of acute infectious phlegmon, although it should be remembered that Senator, in his study of this disease, found that in all cases the pus infiltrated the tissues of the pharynx, and that abscess formation did not occur.

In the cases of Reid, Velpeau, and Kiemann, already referred to, the pus showed a tendency to burrow in the deeper tissues of the neck, in Reid's case extending as far as the pleural cavity, setting up suppurative pleurisy. Death occurred in all cases. These also, we have heretofore suggested, may have been instances of acute infectious phlegmon.

That suffocation may occur from obstruction in the fauces is shown by the instances of such an accident reported by Morgagni[1] and Rilliet and Barthez.[2] This danger, of course, is mainly confined to children, in whom the faucial isthmus is so narrow that a complete occlusion is by no means difficult. In adults, interference with respiration only occurs as the result of a complicating œdema of the glottis, an extension of the inflammatory process, or from secondary irritation of the laryngeal mucous membrane. This accident, however, is far more liable to occur in young children, as in the instance reported by Katterfield, in which the life of a child eleven months old, suffering from quinsy, was saved by tracheotomy alone.

As before stated, when the softening of the inflammatory product which constitutes the phlegmon in quinsy sets in, all the different elements of the tissue break down, and are transformed into pus corpuscles, the central abscess extending by the destruction of neighboring tissues. This destructive process goes on as long as the abscess is confined, destroying everything in its way, and only ceasing with the evacuation of the pus. In its development, necessarily, it must encounter blood-vessels, whose walls yield to the same destructive influence. When such an accident occurs, the blood-vessels being opened, hemorrhage ensues. This becomes not only a very serious but probably one of the gravest accidents which we meet with in connection with this disease. That this occurrence is not more frequent is perhaps to be explained on the ground that the number of blood-vessels of such a size that the rupture of their walls would entail a dangerous hemorrhage is comparatively small in this region. The arteries that may be involved are the tonsillar, ascending pharyngeal, and

[1] "De Sed. et Caus. Morb.," epist. xliv.

[2] "Traité des Mal. des Enfants," 1853, vol. i., p. 227.

internal carotid. The tonsillar artery enters the base of the tonsil at the junction of its lower and middle thirds. As we have already stated, the tonsil is not actively involved in a quinsy, and this artery is not usually encountered by the peritonsillar abscess. Moreover, it is of a somewhat trivial size. The ascending pharyngeal, rising from the external carotid, passes up along the belly of the stylo-pharyngeus, between the internal carotid and the side of the pharynx, and is thus somewhat closely related to the region involved in the phlegmon. This is a vessel of considerable size, and one whose opening might be attended with serious results, and probably has been involved in some of the cases reported, although such has not been made directly apparent by investigation. The relations of the internal carotid to the tonsillar region have already been described (see page 15), making clear how a peritonsillar abscess may extend so far as to involve its walls in the destructive invasion, giving rise to dangerous hemorrhage. Thus, cases have been reported by Macgregor,[1] Mery,[2] Caytan,[3] Treganowan,[4] Immermann,[5] Ehrmann,[6] Grisolle,[7] Savory,[8] Pepper,[9] Norton,[10] Mahomed,[11] Pitts,[12] Messiter,[13] Vergeley,[14] and Weinlechner[15] in which very grave hemorrhage set in during the course of a quinsy, the source of which was attributed to an erosion of the walls of the carotid artery. The exceeding gravity of this complication is evidenced by the fact that in all the above instances the cases terminated fatally, with the exception of those of Mahomed, Ehrmann, Pepper, and Messiter. In a case reported by Cragin[16] the source of the hemorrhage seems to have been somewhat uncertain, although it had the appearance of a rupture of the ascending pharyngeal artery. It should be stated, in regard to this case, that there was some obscurity in diagnosis, although the observer mentions it as one of tonsillitis. It terminated fatally. Moizard[17] also reports a case of troublesome hemorrhage, which

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[1] Cited by Vergeley, Jour. de Méd. de Bordeaux, 1885–86, vol. xv., pp. 545, 559, and 569.

[2] Dauvé: Bull. de la Soc. de Chir., 1870, p. 282.

[3] Ann. de la Soc. Méd. Chir. de Bruges, May, June, and July, 1860.

[4] Cited by Vergeley, loc. cit. [5] Cited by Vergeley, loc. cit.

[6] Cited by Moizard, Journ. de Méd. et de Chir. prat., 1886, vol. lvii., p. 347.

[7] "Traité de Path. Interne," 1852, i., 220.

[8] Cited by Vergeley, loc. cit. [9] Cited by Vergeley, loc. cit.

[10] "The Throat and Larynx," London, 1875, p. 12.

[11] Lancet, London, 1882, vol. ii., p. 775.

[12] Cited by Vergeley, loc. cit. [13] Cited by Vergeley, loc. cit.

[14] Journal de Méd. de Bordeaux, 1885–86, vol. xv., pp. 545, 559, 569.

[15] Wien. med. Blätt., 1885, vol, viii.

[16] New York Medical Journal, 1888, vol. xlviii., p. 233.

[17] Journ. de Méd. et de Chir. prat., 1886, vol. lvii., p. 347.

may have been from an ascending pharyngeal, although this question was not determined, the patient recovering after a single attack of bleeding. In the case reported by Müller[1] the extension of the abscess resulted in an erosion of the facial artery, causing a fatal termination.

In a case reported by J. H. Hall[2] the patient died without operation. In a case reported by Postempski[3] the carotid was ligated. The patient, however, succumbed at the end of twenty days.

Chiari[4] makes the point that the spontaneous evacuation of the abscess may occur in the precoronoid space. It should be remembered, however, that the anatomical regions are practically obliterated by the large extent of tumefaction which occurs. Hence when an abscess "points" in the precoronoid space it means simply a "pointing" far forward on the soft palate.

Among the somewhat unusual results of a quinsy may be mentioned those instances in which the acute symptoms subside, and the case develops into one of a chronic abscess, constituting practically an encysted abscess, as in three cases reported by Garel,[5] in which the condition persisted for several months. In one instance a cure occurred spontaneously, while in the other two it was effected by the use of the galvano-cautery. The course of these cases was marked by repeated attacks of retention of pus, giving rise to painful symptoms for a time, after which a free discharge set in.

TREATMENT.—In this, as in all acute inflammatory affections, our first efforts would be made in the direction of aborting the attack. This can, I think, not infrequently be accomplished if the case is seen sufficiently early. I do not recall, however, an instance in which this effort has been successful later than twenty-four hours after the onset of the disease, and even at this stage it is somewhat rare, although I think that from six to twelve hours after the characteristic pain has been recognized in the fauces there is very fair promise of arresting the further progress of the inflammation by proper measures. These have already been somewhat fully described in the chapter on taking cold, and consist, in brief, of the internal administration of 10 grs. of quinine, in connection with a grain of opium, together with a hot foot-bath and warm drinks, the effort being made to get the system under the full effects of quinine and opium, while at the same time a more or less profuse diaphoresis is established. In connection with this, it is desirable to establish free action of the bowels. This is accom-

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[1] Bull. de Thérap., 1855.

[2] Boston Medical and Surgical Journal, December 22d, 1887, vol. cxvii., p. 604.

[3] Gaz. med. di Roma, Feb. 15th, 1887.

[4] Wien. klin. Woch., 1889, p. 820.

[5] Annal. des Mal. de l'Oreille, 1889, xv., p. 1.

plished preferably by the administration of 10 to 15 grs. of calomel or blue mass, followed by a saline laxative, such as a glass of bitter water or perhaps a Seidlitz powder.

Without waiting to ascertain the effect of the attempt to abort the attack, the patient should immediately be put under those remedies which experience teaches us exercise an almost specific action in the control of a phlegmon in the fauces, viz., anti-rheumatic remedies. The administration of guaiac has obtained a well-deserved reputation for the control of this disease in former times, and is undoubtedly efficacious. At the present day, however, its use has been supplanted by the use of salicylic acid. This we administer in the form of the salicylate of soda, as combining the action of the acid with the well-known action of alkalies upon the rheumatic habit. As early as 1861 we find Hamon [1] administering the bicarbonate of soda with most excellent results. His idea seems to have been, that its action was purely antiphlogistic. It seems not, however, to have come into very general use until the true rheumatic character of quinsy was recognized, after which the alkaline treatment of the disease became the subject of numerous observations. One of the earliest of these and perhaps the most notable was that of Giné,[2] who wrote somewhat at length on the value of not only the internal, but more especially of the local use of bicarbonate of soda. This latter feature of the treatment seems to have been the subject of a somewhat active discussion at the time, which was entered into by Margarit,[3] Armangue,[4] and Oliver,[5] the ground being taken that the local application of the bicarbonate of soda, influenced the quinsy by increasing the secretion, rather than by its specific alkaline action. Clinical experience seems to show, without much question, that the plan of treatment suggested by Giné was of notable assistance to the internal remedies, in controlling the progress of the disease, as is shown by the favorable observations of Stuver,[6] Skinner,[7] and Vinke,[8] as well as by the author.[9]

For the recognition of the valuable properties of the tincture of aconite we are undoubtedly indebted to Sidney Ringer,[10] although

[1] Gaz. des Hôpitaux, 1861, p. 150.

[2] "De la Profyllax. et du Traitement abortif et resolutif de l'Amygdalite simple par le Bicarbonate de Soude," Barcelone, 1883.

[3] Gac. Med. Catal., 1882, ii., 132.

[4] Rev. de Cien. Med., Barcelona, 1883, ix., p. 579.

[5] Gac. Med. Catal., 1884, vii., 517 and 559. Ibid., 1886, vol. ix., p. 161.

[6] Medical News, Philadelphia, 1882, vol. xli., p. 567.

[7] Medical News, Philadelphia, 1883, vol. xlii., p. 156.

[8] Medical News, Philadelphia, 1883, vol. xliii., p. 216.

[9] "The Three Tonsils;" New York Medical Record, October 4th, 1884.

[10] "Handbook of Therapeutics," London, 1872, p. 385.

its use in the treatment of quinsy probably arose much in the same way as that of the alkalies, its administration in acute rheumatism suggesting its use in phlegmonous tonsillitis. That it aids us notably in the treatment of this disease is unquestioned, and we recognize it therefore merely as an adjuvant.

We thus find it to be a well-established clinical fact that the progress of a quinsy is in a very notable and perhaps almost a specific manner influenced by the administration internally of guaiac or, better still, the salicylate of soda; second, by the local application of bicarbonate of soda to the inflamed parts; and, third, by the internal administration of some form of aconite, perferably Fleming's tincture.

We should commence, therefore, the treatment of the disease, first, by the effort to abort it, in the plan above mentioned. Without waiting to observe the result of an abortive treatment, we immediately administer the following:

℞ Sodii salicylatis, ... ʒ ij.
Aquæ, ... ad ℥ vi.
M. S. One tablespoonful every hour.

With each dose of the salicylate there should be administered, to an adult, one drop of Fleming's tincture of aconite. The salicylate should be continued, during waking hours, until a notable impression on the local symptoms has been obtained, unless it be contra-indicated by gastric disturbance or some other complicating circumstance. The drop doses of the tincture of aconite are to be given until the constitutional effect of the drug is recognized by the characteristic tingling of the tips of the fingers and the lips, and the numbness in the fauces if this can be recognized in connection with the localized pain. Of course, the more easily recognizable symptoms of the action of aconite will be those referable to the tips of the fingers and the lips. When these evidences are observed, the further administration of the drug is to be abandoned permanently, as I question if this remedy possesses any properties which act favorably upon the further progress of the disease, its action being confined practically to controlling the morbid process at the onset of the attack, and in aiding to abort it. Furthermore while the aconite treatment is of unquestioned value, it is to be regarded as secondary to that by the salicylates.

It is scarcely necessary to state that so powerful a drug as aconite should be administered with the greatest care; and if a prescription is left to be given in the above manner, the most thorough and explicit directions should be left with the patient, to

enable him with certainty to recognize the symptoms of the physiological action of the drug. If there should be any hesitancy to administer it in this manner, based on a lack of intelligence on the part of the patient or attendants, it is quite safe, I think, to direct four or perhaps five doses to be given, when its further administration should cease.

Green[1] would seem to suggest that the drug is more efficacious in children—a point which is apparently well taken.

The salicylates we give thoroughly well diluted, in order to avoid, as far as possible, any local irritation to the stomach.

In addition to the above remedies, the patient himself should be supplied with a saucer of bicarbonate of soda. By simply wetting the fore-finger and dipping it into the soda, he can plaster the drug quite easily over the inflamed portion of the fauces. This can be repeated every half-hour; and I am disposed to agree with Giné in regarding this measure as of the greatest possible value, and should even go so far as to consider it of almost equal value with the internal administration of the salicylates. As to what its action is, I have no suggestion to make. Clinical experience teaches us that it not only controls the local morbid process, but that it also serves to mitigate, in a notable degree, the severity of the local pain.

The above plan of treatment, as has been suggested, is carried out, at first, in the effort to abort the disease; but even failing this, it constitutes the plan of treatment which is to be still further pursued, even in those cases where we fail to arrest the affection. And even in such a case I think we will be convinced of the beneficial action of these remedies, in that where suppuration occurs this process is hastened in a very striking manner. Certainly in a number of cases which have come under my own observation I have been satisfied that the suppuration which set in on the second day was largely the result of the internal medication, in that we do not usually expect the abscess to form so early in a case of quinsy which has not been markedly influenced by therapeutic measures. The success of the abortive treatment is very strikingly illustrated by the statistics of fifty cases of quinsy published by Knox.[2] There was a rheumatic history in forty-five. In these cases, the internal administration of an alkaline salicylate, together with the local application of bicarbonate of soda, was resorted to, resulting in the arrest of the disease, in forty instances, in from thirty-six to seventy-two hours. In five, suppuration occurred. In the five in whom there was no rheumatic history, quinine was administered, with the

[1] British Medical Journal, 1887, vol. i., p. 1158.

[2] Chicago Medical Journal and Examiner, 1886, vol. liii., p. 208.

result of suppuration in four cases. This is a somewhat remarkable series of cases, and such favorable results can scarcely be anticipated by all, although Atkinson,[1] in laying down a specific plan for the carrying out of the alkaline treatment, goes so far as to state that "resolution is almost always brought about, and patients are, with scarcely a single exception, able to resume their duties about the fourth day." He administers 20 grs. of the bicarbonate of potassium, together with 15 grs. of citric acid, in an effervescing draught every four hours, in connection with guaiac lozenges and tincture of iodine gargles, with mild stimulation and frequent alimentation.

Notwithstanding the large clinical indorsement which the salicylate treatment has received, many still adhere to the guaiac treatment, which is undoubtedly efficacious. Thus Mackenzie[2] makes use of guaiac both internally and also locally in the form of lozenges. I am disposed to think, however, that we may place our trust more securely in the use of the salicylates. As illustrating the vagueness and lack of harmony of the views which prevailed in regard to the treatment of quinsy up to a comparatively recent date, it is interesting to note the special inquiry which was instituted by the editors of the *Practitioner* as late as 1876 in regard to this point.[3] Of 112 replies received to a circular sent out, 36 physicians stated that they gave preference to the use of guaiac, 30 advocated the value of chlorate of potash, while but 27 administered aconite. The other drugs advocated by those who responded to the circular were nitrate of potash, saline purgatives, diuretics, quinine, hydrochloric acid, sulphate of magnesia, belladonna, sesquicarbonate of ammonia, mercury, etc.

The only further question of importance to discuss in this connection is the resort to surgical measures. From the onset of the attack, the fauces should be repeatedly examined with the greatest care, both by inspection and digital exploration. This is to be done in order to determine the extent and situation of the phlegmon and its progress toward suppuration. This digital exploration should be made at least twice daily, and the evidence of softening and pus formation recognized, together with the point at which the abscess is approaching the surface.

The earliest recognition of the pus is conveyed to the finger in the sense of a semi-elasticity, or an obscure feeling of deep fluctuation. This can be absolutely determined by inserting two fingers, usually the index fingers of both hands, but ordinarily I think the

[1] Practitioner, London, 1885, p. 339.

[2] "Diseases of the Throat and Nose," Am. ed., Philadelphia, 1880, vol. i., p. 72.

[3] Practitioner, London, January, 1876, p. 43.

insertion of a single finger is sufficient. When the abscess approaches the surface, the little point of softening at the apex of the phlegmon can be easily determined. Additional evidence of the existence of pus is obtained by making slight pressure with the tip of the finger on the bulging tumor, while at the same time the part is brought under ocular inspection. In this way a small whitish spot is left immediately behind the finger as it moves across the apex of the projecting phlegmon. This combined inspection and palpation is not difficult of accomplishment, with a proper light, a good head-mirror, and the use of a spatula. Of course the design of all this is to enable us to open the abscess at the very earliest possible period in the course of the disease, for, as we understand, immediately upon opening the abscess the sufferings of the patient cease; and when we consider the severity of the pain, and the great distress of the patient, it becomes an imperative duty that these should not be permitted an instant longer than is absolutely necessary.

Having established the existence of pus by digital palpation, it is not easy to locate this for cutting purposes, except in the method already suggested, viz., by holding the finger upon the tumefaction and inspecting the parts, while the tongue is depressed by the spatula. When this point has been established, a small, sharp-pointed bistoury should be plunged boldly into the mass for three-eighths to half an inch, the depth of the incision being dependent, of course, upon the locality and the recognized danger of reaching large blood-vessels. In making the incision, it is important that it should be of sufficient size to enable the pus to escape freely. The length of the opening should be at least a quarter of an inch, and may be even more with benefit. If pus does not flow at the first incision, a silver probe should be inserted through the opening, and carried in different directions with some little force, in search of the pus sac. If the flow of pus is still not established, additional openings may be made. The parts seem, to a certain extent, to lose their resiliency, and even with a free opening the pus does not always flow readily; hence it may become necessary to assist the flow, by means of a probe, until the cavity is evacuated. In making this incision, one always bears in mind the proximity of the large blood-vessels of the neck, and the possible danger of wounding them. I have incised the phlegmon in a very large number of instances of quinsy, and in no case have I done it without a certain degree of nervousness on this account; and yet it seems to me that if one recognizes the true pathological condition, and has localized the suppurating point, one ought to feel confidence in the manipulation. When, however, we con-

sider that so great a surgeon as Chassaignac,[1] in operating upon a faucial phlegmon, wounded what was probably the internal carotid artery, necessitating a ligation of the common carotid, this would seem to be an accident that might happen to any one. Similar instances are reported by Duke[2] and Murphy.[3]

The still further suggestion arises, as to the propriety of the use of the knife before evidences of pus have been obtained. Our older writers advocate scarification of the tonsil in this disease. It is scarcely necessary to say that scarification of the tonsil is not indicated; furthermore, I should hesitate to scarify, or, in other words, to make long superficial incisions along the inflamed part. I am confident, however, from a number of experiences, that much relief may be obtained by local blood-letting. This should be accomplished by a narrow, sharp-pointed knife, such as an iridectomy knife, with which five to eight punctures should be made directly into the inflamed tissue, the knife being plunged in, rather than swept across it. This is always attended with relief to vascular tension, and consequently to the local pain. If for no other purpose, then, than this, it may be resorted to, notwithstanding the assertion of Verneuil[4] that no good is to be accomplished by this procedure.

In addition to these measures, no little can be accomplished in the way of relieving symptoms, and adding to the comfort of the sufferer, by attention to certain minor details. Prominent among these, perhaps, is the holding of a pellet of ice in the mouth, allowing it to lie against the inflamed parts, and also by swallowing small pieces. Browne seems to think this may aggravate the trouble, although usually patients find it grateful. Gargling the throat with water as hot as can well be borne occasionally affords a certain amount of relief. The use of heat or cold is to be governed by the sensations of the patient. Medicated astringent applications, in the form of gargles or sprays, do no good, other than removing artificially the accumulated mucus and saliva, which the semi-paretic condition of the fauces prevents the patients from expelling themselves. Inhalations of steam, or medicated vapors also, I think, accomplish little else than to amuse the patient. As to external applications in the form of poultices, hot compresses, cold compresses, ointments or liniments, and measures of that sort, I have little confidence in them; they add to the discomfort of the patient and are not to be depended upon as accomplishing any good result.

[1] Bull. de la Soc. de Chir., 1859, vol. x., pp. 83, 86, 137, 219.
[2] Lancet, London, 1848, vol. i., p. 233.
[3] Albany Medical Annals, 1888, vol. ix., p. 78.
[4] Gaz. des Hôpitaux, 1879, vol. lii., p. 162.

Kurtz[1] reports an instance in which cocaine seemed to have exceedingly happy effects in allaying pain, thereby allowing the patient to swallow with comfort, and also controlling inflammatory action. The local effect of this remedy, at best, is but superficial, and I certainly should not regard it as one to be depended upon, except in somewhat rare instances, although Haviland Hall[2] makes the extraordinary statement that he has observed the local application of cocaine to check the suppurative process in a quinsy.

After the abscess of a quinsy has been evacuated, the whole of the inflammatory process subsides, and the indications for treatment disappear. It usually leaves no sequelæ which carry with them any indications for further therapeutical measures, unless perhaps we include in this category those cases in which serious hemorrhage has occurred. The clinical history of these cases shows that the hemorrhage is apt to recur; hence where such an accident has happened, the case must be watched with the greatest care, and preparations be made for ligating the common carotid artery. Where the hemorrhage has been severe in character, it may be that this should be done without waiting for further developments; certainly the danger of a recurrence of a hemorrhage should always be kept in view. Thus, in Messiter's case, a second hemorrhage occurred twenty-four hours after the primary attack, while a third attack occurred three days later.

The clinical history of a case of quinsy, as we know, is that of recurrent attacks, during the spring and fall. In many cases this tendency disappears apparently without cause; the patient outgrows the habit as we say. This disposition, however, to outgrow the habit, cannot be depended upon, and it becomes our duty to aid our patients, as far as possible, in throwing it off. The existence of enlarged tonsils we recognize as one of the predisposing causes of the attack; hence it becomes our especial duty, in all cases where they are present, to extirpate them if the quinsy habit exists. By this measure we do not always remove the habit immediately. I have not infrequently seen patients have a violent attack of quinsy after the removal of enlarged tonsils. I think, however, that the disposition to a quinsy disappears, after the first or perhaps the second attack, following the excision of the tonsils. Certainly this operation aids the individual very notably in recovering from the tendency to quinsy. Of course any other local inflammatory condition of a chronic character, in the fauces or upper air passages, should be as far as possible removed, although we do not recognize ordinary catarrhal troubles as predisposing

[1] Memorabilien, Heidl., 1886, n. s., vol. vi., p. 7.
[2] British Medical Journal, 1888, vol. i., p. 1,060.

to a quinsy. The only other indication for general treatment consists in the regulation of the general habits of living. For this purpose I have no practical suggestion to make, other than those already discussed in the chapter on taking cold, in the previous volume. These consist in keeping the skin in a healthy condition of activity by the daily use of the sponge bath, followed by vigorous friction with a coarse towel; the use of all-wool underwear of a proper texture; the regulation of the outer clothing, and such other hygienic measures as may be indicated. As regards any course of treatment for rheumatism, such as by baths, mineral waters, or the internal use of drugs, I have no especial suggestions to advance. The connection between quinsy and rheumatism is thoroughly well established from a clinical point of view; and if an individual with the quinsy habit suffers from any prominent rheumatic manifestations during the intervals or after an attack of faucial abscess, there can be no question as to the propriety of a course of internal medication. It has been my own practice in such a case to administer the salicylates for a period of from four to six weeks, in from 10 to 20 grain doses, given three times daily, provided they are tolerated by the stomach. If contra-indicated, trial may be made of the oil of wintergreen, salol, iodide of potash, or other anti-rheumatic remedies. Our main reliance, however, will be in the removal of enlarged tonsils, the correction of other local disorders in the air passages, and the proper regulation of the habits of life.

CHAPTER XI.

HYPERTROPHY OF THE TONSILS.

As we have already learned, the faucial tonsils are composed almost entirely of that somewhat curious tissue which is especially liable in the earlier periods of life to become the seat of morbid changes, viz., the lymphatic tissue. Furthermore, when any morbid process fixes itself upon these structures, it ultimately results, in the very large majority of instances, in the development of a permanent hypertrophy. Probably in no masses of lymphatic tissue found in the body is hypertrophy more frequently met with than in those masses which are found lying between the pillars of the fauces, and which are designated as the faucial tonsils. We use the term hypertrophy of the tonsils to define that condition of enlargement of these organs which is characterized by excessive development of the normal anatomical elements of lymphatic tissue, thus excluding from this designation those conditions not infrequently met with in which the tonsil is abnormally enlarged as the result of inflammatory action, whether acute or chronic, the accumulation of cheesy matter in the crypts, calcareous concretions, tumors, etc.

Etiology.—Undoubtedly the most prominent predisposing cause of this affection lies in that peculiar diathesis which we may call the lymphatic habit. The clinical significance of this peculiar diathesis has already been discussed somewhat at length in a previous chapter.[1] What was there stated in discussing the subject of hypertrophied pharyngeal tonsils, I think, is equally true of the faucial tonsils. The ground there taken was that, while this special susceptibility to diseased conditions in the lymphatic tissues was not to be accepted as evidence of the strumous habit, or as a manifestation of struma, yet that there was undoubtedly a somewhat close relation between the two diatheses. I know of no statement which it seems to me more clearly defines this relationship than that of Potain,[2] when he asserts that "The tendency to the involvement of the lymphatics in morbid processes," or "*lymphatisme*," as he calls it, "so characteristic of child life is but a nor-

[1] Vol. i., p. 539.

[2] "Dict. Encyclop.," Art. Lymphatique. Paris, 1870, vol. iii., p. 485.

mal condition, which, carried one step further, gives us the true pathological condition of scrofula." Mackenzie,[1] Lennox Browne,[2] Sajous,[3] Robinson,[4] and indeed perhaps most writers on the subject attach a certain importance to the influence of scrofula in the production of these hypertrophies.

I do not know what definite organic lesion constitutes scrofula. The lesion which constitutes Potain's *lymphatisme* seems clear enough. Carry this one step further, to the development of large masses of swollen glands in the neck, and we have a condition which all recognize as struma. I take it that the occurrence of suppuration in these glands might be considered as a still further step. If Potain's *lymphatisme* is to be taken as an early stage of scrofula, the assertion of Mackenzie and others is correct. As a matter of clinical experience, however, I think that it is somewhat rare to find any diathetic condition in children suffering from enlarged tonsils, further than Potain's *lymphatisme*. In my own experience, extending over a somewhat large number of cases, I am disposed to say that the percentage of instances in which the existence of enlarged tonsils has been attended with scrofulous glands in the neck, or suppuration therein, would not be over from five to eight per cent—a percentage of genuinely scrofulous patients which would go but little toward establishing the rule.

While, therefore, we accept the development of enlarged tonsils as a manifestation of *lymphatisme* in the very large proportion of cases, I think it must be accepted as an evidence of true scrofula in but a small number, although no one would question that quite frequently young children suffering with scrofula suffer also from enlargement of the faucial tonsils. A still further statement, however, must be made, and I think an important one, viz., that this lymphatic habit, which predisposes to the development of enlarged tonsils in a very small proportion of cases, possesses any tendency to a further progress toward genuine struma.

Recognizing, then, the existence of a diathetic habit as causing the disease, this necessarily involves the further statement that it is hereditary. This fact is constantly taught us by clinical experience, in that we frequently see several cases occurring in children of the same family, and furthermore learn of one or both the parents having suffered in the same way.

The disease is essentially one of child life, and develops somewhat early. Probably in many instances the commencement of

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[1] "Diseases of the Throat and Nose," Am. ed., Philadelphia, 1880, vol. i., p. 75.

[2] "The Nose and Throat and their Diseases," London, 1890, p. 251.

[3] "Diseases of the Nose and Throat," Philadelphia, 1886, p. 286.

[4] "Keating's Cyclop., Diseases of Children," vol. ii., p. 461.

the morbid change occurs during fœtal life. As a rule, however, the organs commence to enlarge at about the age of three or four. Many statistics have been published showing definitely the ages at which this disease is met with. This gives little information, however, in that the statistics simply show the ages at which the cases presented for observation. Mackenzie,[1] in an analysis of 1,000 cases, found 673 males and 327 females. This scarcely coincides with my own experience, for whereas perhaps the additional exposure to which boys are subjected may render them more susceptible to catarrhal inflammations, and may therefore result in a larger proportion of cases of enlarged tonsils, the excess is not great. Moreover, I am disposed to think that the influence of sex upon the development of diseased conditions in the air passages is limited somewhat to the above conditions, at all periods of life. Before the development of sexual individuality, this influence must be exceptionally small.

Among the most active causes of the disease must be recognized the occurrence of scarlet fever, diphtheria, measles, and smallpox, in the order of their importance, the local morbid process which accompanies these diseases seeming to stimulate an activity in the lymphatic structures of the throat which results in a permanent condition of hypertrophy.

Cornil[2] very shrewdly suggests that these diseases, being infectious in character, naturally give rise to inflammation of the lymphatic glands in the deep-seated structures of the fauces, and thereby set in play forces which result in permanent hypertrophies—a process which is by no means liable to follow a simple catarrhal inflammation in this region.

How large a proportion of instances of this affection follow the infectious diseases noted above I have no means of determining, but I am disposed to think that probably from one-third to one-half of all cases arise in this way.

The recurrent attacks of catarrhal sore throat, also, to which young children are so liable, may serve to stimulate the lymphatic hypertrophies, although in most instances undoubtedly the chronic process develops first, and the recurrent acute attacks subsequently become largely symptomatic.

While, therefore, we account for quite a large proportion of instances of hypertrophied tonsils by the predisposing influence of the lymphatic habit, and accept the occurrence of one of the exanthems as the immediately exciting cause, we must recognize the fact that the disease may develop insidiously, and without any

[1] Op. cit., p. 75.

[2] L'Union Méd., 1881, 3d series, vol. xxxii., p. 596.

apparent cause, being an essentially chronic affection from the onset.

Hamonic[1] reports a number of cases which appeared to be due entirely to syphilitic infection. These instances all occurred in young adult life and in the earlier stage of the specific infection, usually from two to six months after the primary lesion. Hamonic takes the ground that these hypertrophies are in the nature of secondary adenopathies in which the lymphatic bodies which form the faucial tonsils assume the same relation to the syphilitic infection as do the lymphatics of the cervical and other regions.

He reports a number of instances in which hypertrophies of a very large size were observed in syphilitic patients, which disappeared completely under specific treatment. The cases are somewhat unique and certainly very interesting, and the carefulness and detail with which they are given, with the uniform success in treatment, compel us to accept this as an efficient cause of tonsillar hypertrophy; although we must bear in mind that the term "hypertrophy" used in this connection bears no definite relation to the same term used in connection with the ordinary hypertrophy of the tonsils. It is more closely allied perhaps to that form which we meet with when the primary lesion develops in the tonsil.

Of course, if the specific hypertrophy is engrafted upon an ordinary chronic hypertrophy of the tonsil, the whole of the enlargement does not disappear upon the administration of anti-syphilitic remedies, but only that portion which is due to the specific poison.

Hamonic's deductions are based on the observation of one hundred and twenty cases, sixteen of which are reported somewhat in detail.

PATHOLOGY.—In an earlier work[2] I described, for the first time, I think, two varieties of hypertrophied tonsils, viz., the hypertrophic form and the hyperplastic form, the former term being used to designate the variety of enlarged tonsils most frequently met with, and which consists of an abnormal increase of all the normal elements which go to make up the organ; while the latter term was used to designate that form of hypertrophy which is ordinarily met with at a later period than early childhood, and is composed very largely of connective tissue.

In the hypertrophic form we find the organ greatly increased in size, and studded, as in health, with from seven to twelve regularly shaped openings which mark the orifices of its crypts. It is covered by mucous membrane, which passes down into and forms a lining to the enlarged crypts. Its epithelium is unaltered. Beneath this,

[1] Annal. de Derm. et Syph., 2 Ser., 1883, vol. iii., p. 467 *et seq.*

[2] "Diseases of the Throat and Nose," New York, 1881, p. 129.

however, we find the papillæ flattened and more widely separated than normal, apparently as the result of the distention of the organ. Beneath the mucosa we find a submucous layer, notably augmented by the deposit of connective-tissue fibres. The crypts of the tonsil are increased in size, and usually will be found extending down to the base of the organ. They contain a certain amount of worn-out and degenerated epithelium and mucus, forming the ordinary cheesy matter which so frequently shows itself on the surface of the organ. The tissue lying between the crypts is made up mainly of lymphatic bodies largely augmented in size, each lymphatic body being invested by an increased amount of connective tissue, while the spaces between these investing fibres are also filled in by bundles of the same material.

Practically, then, the ordinary hypertrophied tonsil is made up of an increase in the size and number of the lymphatic bodies, with a commensurate increase in the fibrous tissue which forms their framework, and also that which fills the interspaces between them. In addition to this, there is a notable thickening in the lining of the crypts, together with an enlargement of the blood-vessels.

In the hyperplastic form, the only change which we note is that, while the body of the tonsil is augmented by an increase in number and size of the lymphatic bodies, the process which involves these is somewhat limited, while the excessive morbid process expends itself in the development of the connective tissue surrounding the lymphatic bodies. To such an extent does this proliferation go on that the tonsillar crypts are practically destroyed and obliterated. In this way there is formed a large mass, made up of bundles of connective tissue containing within their meshes a certain number of lymphatic bodies. The blood-vessels are also markedly encroached upon, and the vascular supply therefore notably diminished. The investing mucous membrane presents no abnormal appearances. We thus find a rounded, somewhat smooth-surfaced organ, presenting slight depressions on its surface, marking the locality of pre-existing crypts. It is of a pale color and largely made up of connective tissue.

In both forms of enlargement we find the lymphatic bodies in a state of true hypertrpohy, and yet the process belongs essentially to the tonsils, in that we find no traces of the giant cell which characterizes a scrofulous enlargement of glands as found elsewhere in the body.

Legendre[1] describes two varieties of hypertrophied tonsils, according to the direction which they take. One the antero-posterior, separating the two pillars of the fauces antero-posteriorly,

[1] L'Union Méd., 1888, 3d series, vol. xlvi., pp. 457 and 519.

without projecting beyond them; while under the name of transverse, he describes the tonsil which projects into the fauces. A somewhat similar division is made by Semon.[1] These divisions were suggested mainly with reference to methods of treatment. I am not disposed, however, to attach much practical importance to them, in that the growth and development of the organ in hypertrophy is governed largely by the conformation of the parts, and other adventitious circumstances. From my own experience I am disposed to think that the most marked tendency is to grow downward, in many cases the organ sending out a sort of prolongation or tongue from its lower attachment. This, of course, is largely the result of the mechanical movements of the part. As a rule, in young persons the enlarged tonsil maintains its individuality and is only attached to the faucial tissues by its base.

In some instances, probably as the result of repeated attacks of acute inflammation, we find the face of the enlarged organ firmly attached to the inner side of one or both pillars of the fauces—a condition which should always be investigated before operative procedures are undertaken, as otherwise the success of the manipulation might be hampered.

Recognizing the fact that the disease is dependent on a diathetic condition, we can easily understand why, in most instances, hypertrophied tonsils occur bilaterally, although as evidence of the probability of local causes acting to a certain extent in the causation of the hypertrophy we occasionally find one tonsil quite extensively enlarged, while the other may be practically in a state of health.

The hypertrophied tonsil thus constituting a large tumor or mass, as it were, lying in the fauces and containing a number of deep, irregular crypts or pockets, the natural result is that considerable masses of mucus and worn-out epithelial cells collect in these pockets, which are provided with no mechanism for emptying themselves. These collections undergo fatty and cheesy degeneration, as is evidenced by the periodical discharge of grayish-white, ill-smelling masses from one or the other of the crypts. They possess no especial clinical significance, the whole process being a somewhat adventitious feature of the hypertrophy of the organ.

This same lymphatic diathesis which predisposes to the development of enlarged faucial tonsils predisposes also, with equal activity probably, to the development of hypertrophy of the pharyngeal tonsil. Hence it is the rule, rather than the exception, in children certainly, that where we meet with the disease in one region we

[1] St. Thomas' Hospital Reports, 1883, London, 1884, vol. xiii., p. 129.

also find it in the other. The same predisposition also exercises its influence on the glands in the glosso-epiglottic fossæ, which are occasionally found involved in a similar process. This latter form of disease, however, belongs more particularly to early adult life.

SYMPTOMATOLOGY.—The symptoms to which the presence of enlarged tonsils gives rise are to an extent mechanical, and are in the main due to the fact that these prominent masses on either side of the fauces act somewhat as foreign bodies, hampering and interfering with the proper function of the parts. If the enlargement is but moderate in extent, they may not give rise to any special disturbance, other perhaps than a liability to recurrent attacks of acute sore throat. During the intervals between these attacks, their presence may not be felt.

The same also can be said in regard to that form of tonsil which we have spoken of as the hyperplastic, viz., the dense, fibrous form.

The large spongy mass of the true hypertrophied tonsil, however, with its ragged exterior and largely dilated crypts, may give rise to both local and general symptoms of a marked character.

The character of the voice is altered, and presents a tone which is peculiar and characteristic, as of one attempting to talk with a full mouth. Moreover, there is a certain absence of the nasal tones, owing to the mechanical interference with the projection of the vocal waves into the nasal cavity.

Respiration may be slightly impeded by the mechanical encroachment of the tumors upon the fauces and oropharynx. Notable dyspnœa, however, does not occur, although Legendre[1] reports having observed asthma dependent upon this condition. If the theory already advanced[2] in regard to the etiology of this latter disease be correct, it can be easily understood how an obstructive lesion in the fauces might in certain instances be its exciting cause.

Deglutition is liable to be interfered with, to an extent dependent upon the size of the growths.

While the interference with respiration may not cause any conscious symptoms of dyspnœa on the part of the patient, yet that there is mechanical interference here, I think, is unquestionably shown by the fact of the occurrence of nightmare so frequently observed in children. This symptom I regard as peculiarly symptomatic of enlarged tonsils. It arises from the fact that, the entrance of air to the lungs being slightly impeded during sleep, there follows a slowly but surely increasing lack of proper oxygenation of the blood, resulting in an increase of the *besoin de respirer* until

[1] Loc. cit. [2] Vol. i., p. 238.

it culminates in a sense of oppression or suffocation, under the influence of which the child awakes alarmed and terrified. The characteristic difference between the nightmare of enlarged tonsils and that of undigested food in the stomach is this: that whereas the latter, as a rule, occurs but once during the night, the former may repeat itself a number of times. If this interference with respiration is not sufficient to produce nightmare, it is very liable to give rise to disturbed and restless sleep.

Mouth-breathing, especially in young children, is apt to be the rule, and this, I take it, is in no small extent due to the presence of the enlarged glands in the fauces projecting into the oro-pharynx in such a way as to interfere with the entrance of the inspired air through the nasal passages, although undoubtedly this obstruction in many cases is to be attributed to the coexistence of an enlargement of the pharyngeal tonsil. As the result of the mouth-breathing, the fauces become dry and an irritating cough may occur during the night. If these symptoms present during waking hours, it may be the result of the growths hanging down and impinging upon the epiglottis, or the cough may be of reflex character, as it seems fair to suggest was the case in the instance reported by Harrison Allen,[1] although he vaguely attributed the cough to pharyngeal irritation. That this may be the explanation is further indorsed by the observations of Ruault,[2] who states that if a small heated electrode be placed about the centre of the tonsil it gives rise to a sharp pain in the ear; and that if, furthermore, it be moved slowly down along the face of the organ a spasmodic cough, vomiting, and gastric pains will be excited. He considers these symptoms due to reflex action, in that they are not infrequently present in chronic inflammation of the tonsil.

How far impairment of hearing is due to the enlargement of the faucial tonsils is a question by no means easy to determine in every case, in that we must all recognize the existence of an enlarged pharyngeal tonsil as a far more prolific source of middle-ear disease than of the faucial tonsil. The two diseases occurring so frequently in the same individual, therefore, renders it difficult to determine wherein lies the source of an existing impairment of hearing. That, however, the faucial tonsil does exercise an influence in many cases is clearly shown by the fact that the hearing improves by the removal of these glands. Again, it must be remembered that the removal of the faucial organs affords a certain amount of relief to the engorgement of the pharyngeal growths. It is often stated that the deafness is due to the pressure of the en-

[1] Medical News, Philadelphia, 1882, vol. xli., p. 31.

[2] Arch. de Laryngol., April, 1889.

larged faucial glands upon the anterior lip of the pharyngeal orifice of the Eustachian tube. I do not believe this is a very active factor in the production of deafness. I am disposed to think that a more active factor lies in the interference with the proper functional activity of the faucial muscles, which have to do with the renewal of air in the tympanic cavity, viz., the petro-salpingo-staphylinus or tensor palati muscle and the spheno-salpingo-staphylinus or levator palati.

While we occasionally meet with children with enlarged tonsils who enjoy apparently perfect health, yet I think it is the rule that the presence of these large bodies in the facues gives rise to a more or less notable impairment of the general health. This, I take it, is due in no small degree to the interference with proper respiration and oxygenation of the blood, in connection with the lack of that quiet, restful sleep which is so important for young children. As contributing to this impairment of health, I think also we must recognize the fact that the digestion and nutrition are notably interfered with by the presence of these glands. Semon[1] suggests that the stomach disturbance in these cases is due to improper mastication of the food. That the presence of enlarged tonsils may interfere with mastication is probably true. I am disposed to think, however, that the fetid and offensive masses of cheesy matter which accumulate in the tonsils, and are squeezed out and swept into the stomach in the act of deglutition, containing as they do decaying animal matter and numberless adventitious bacteria, may act as ferments to set up gastric disturbance. In addition to this, we must bear in mind that every breath of air which passes into the lungs passes over these receptacles of effete matter, and must be to an extent polluted. Practically, then, a child with enlarged tonsils lives in a constantly vitiated atmosphere. That this is true, I think, is easily shown by the sour and fetid character of the breath in such a large proportion of the cases.

Excessive secretion of mucus is not characteristic of this disease. If such is present, it must be attributed to the existence of morbid conditions in the pharyngeal vault, although of course the crypts of the follicles secrete and expel a certain amount of glairy mucus or muco-pus. Cheesy concretions, with their periodical expulsion, are quite common. In adults, these concretions occasionally distend the follicles and give rise to painful deglutition, and may be a constant source of irritation in the fauces. Their appearance in the expectoration, also, is liable to be a source of apprehension when their origin is not fully appreciated. When the orifice of a crypt lies beneath the fold of the faucial pillar, these

[1] St. Thomas' Hospital Reports, 1883, vol. xiii., p. 131.

concretions become imprisoned, and the irritation caused thereby is notably increased. Farmer[1] reports a case in which thick pus became thus imprisoned, and was discharged periodically. This, however, I think is rare, as the local disturbance only arises after the mucus has become hardened and degenerated. Roe[2] seems to think that these cheesy concretions may give rise to disturbances of the air passages below, with a somewhat wide range of neuralgias; while Swain[3] reports a case in which he attributes an obstinate morbid condition of the lingual tonsil to the same cause. My own belief is that as a rule the affection is purely a local one, and gives rise to purely local symptoms. It is by no means easy for a patient to definitely localize his own sensations in the fauces, and it is equally difficult oftentimes for the physician to definitely localize the source of a symptom complained of.

No discussion of hypertrophied tonsils is complete without reference to Dupuytren's[4] famous case, in which hypertrophy of the tonsils was supposed to have given rise to the so-called pigeon-breast and other distressing conditions. Allusion has already been made to this case,[5] and it need only be further said that writers generally agree now that in this case the deformity and the enlarged tonsils were both dependent primarily upon the rachitic habit. That a case of enlarged tonsils ever gave rise to chest deformity can scarcely be accepted.

Weiss[6] reports a somewhat distressing case of vertigo occurring in a boy aged twelve, with enlarged tonsils, which was entirely relieved by the removal of the offending organs. He attributed the symptom to the pressure exercised upon the pneumogastric nerve and carotid arteries. This is a somewhat novel suggestion, and may be a correct one, and yet it is difficult to understand how these soft, spongy organs could exercise any appreciable pressure upon parts beyond the fascia which underlies them.

DIAGNOSIS.—Any enlargement of these organs is of course easily recognized upon direct inspection. In order, however, to properly estimate the character and extent of the hypertrophy it is a matter of some importance that the fauces should be inspected while at complete rest, for, as we know, if the parts are irritated, retching occurs, the first motion of which consists in the contraction of the palato-pharyngeal muscles. In this movement the tonsils are thrown forward, to such an extent that even those which are but moderately enlarged will appear as if they were in contact

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[1] Brit. Med. Jour., 1884, vol. i., p. 602.

[2] Trans. Am. Laryngological Ass'n, 1889, p. 87. [3] Ibid., p. 92.

[4] Répertoire générale d'Anatomie et de Physiologie, 1828, p. 110.

[5] Vol. i., p. 551. [6] Memorabilien, Heidelberg, 1882, n. s., vol. ii., p. 469.

in the median line. It is therefore necessary that the tongue should be pressed down firmly but slowly, while at the same time it is drawn forward, the spatula being placed well back upon the dorsum in the manner already described.[1]

In this way an inspection of the fauces in a state of complete rest can be obtained, even in a patient whose throat is unusually irritable, provided sufficient patience is exercised.

As before stated, the enlarged organ may project prominently into the fauces, or it may lie deeply between the pillars in such a way as not to project beyond their border. It is important, then, I think, that we should recognize the existence of an hypertrophic process, even though the enlargement has not attained large proportions, for as we have already learned, a very moderately enlarged tonsil, especially in an adult, may be the source of no little annoyance or even suffering. We must bear in mind also that we not infrequently find that the surface of the tonsil has formed adhesions with the pillars of the fauces in such a manner as to cover up and mask the diseased structures. The existence of these adhesions is easily elicited by the use of a bent probe. As a rule, they are not very firm, and are easily broken up. This should be done in all cases, in order to accurately determine the extent of the morbid process.

Another method of examination which should always be practised, I think, where the tonsils are broad and flat, is to press the end of the spatula firmly against the lower and anterior portion of the organ in such a way as to turn its face outward, thus bringing it into more direct vision, while at the same time those portions which are hidden beneath the faucial pillar are also brought under inspection.

In searching for obscure sources of irritation, such as abnormal adhesions, the existence of cheesy matter, imprisoned mucus, or crypts concealed beneath the folds of the faucial pillars, resort should be had both to the use of the probe and also, if necessary, the tenaculum for dragging the mass from its bed for more complete inspection.

I have never met with a case in which the diagnosis presented any points of difficulty, as the recognition of true hypertrophy should always be made beyond any question of doubt. Mistakes may occur, however. Thus, in several instances the presence of a tonsillith has been overlooked and only discovered in the attempt to amputate what was supposed to be an ordinary hypertrophy of the tonsil. Malignant disease also may develop so insidiously as to fail of recognition in its early stages. Thus Campbell[2] reports

[1] Vol. i., p. 21. [2] Liverpool Med. and Chir. Journal, 1885, vol. v., p. 28.

a case in which, seven weeks before death from carcinoma of the tonsil, the organ presented no appearances which indicated other than simple hypertrophy; while a number of cases are reported as having been operated upon in Schroetter's[1] clinic, for simple enlargement, which were subsequently discovered to have been lympho-sarcoma. The only suggestion to be made here is that a unilateral enlargement of the tonsil, in adult life, should be looked upon with suspicion, and investigated with the utmost care, especially if the patient has passed middle life.

PROGNOSIS.—Hypertrophy of the tonsils may commence at any period of extra-uterine life and probably in fœtal life, up to the age of from twelve to fifteen, when the tendency to its development apparently ceases with the setting in of those changes of life which characterize the advent of puberty. I have never known a case of enlarged tonsils to develop after puberty, although there is no question that certain adventitious conditions may occasionally develop in these organs by which they become a source of irritation. This probably is dependent upon the retrograde changes which occur at puberty, for, as we know, these structures undergo a shrinkage at this period, so that at about the age of eighteen or twenty, in most instances, they have practically disappeared from the fauces. It is in this process of shrinking, undoubtedly, that the tonsil assumes such shape as to become a source of irritation in adult life in the formation of crypts for the retention of cheesy matter, adhesions to the pillars of the fauces, etc.

While, therefore, the prognosis toward disappearance at puberty is fully recognized, and while moreover the disease itself entails no special danger to life, I think we must recognize the fact that they constitute an exceedingly serious menace to health, not only in those symptoms which belong to the disease itself, but also, and this fact I think should be especially emphasized, viz., that these large, spongy masses in the fauces of a child involve a particular susceptibility to the infectious diseases of childhood, especially diphtheria, scarlet fever, and croup. Moreover, if a child with enlarged tonsils is seized with scarlet fever or diphtheria, the case is liable to run a much more serious course than if these glands were not in this diseased condition. I think, therefore, that physicians are scarcly justified in waiting for the process of nature to remove these organs by atrophy, even if it be a matter of but few years until puberty comes on, in that those few years may be a period of danger to the child. Moreover, I know of no possible reason against their extirpation. I regard enlarged tonsils in the fauces as neoplasms, quite as much certainly as a fibroma or other

[1] Jahresb. der Klinik für Laryngol., Wien, 1871.

homologous growth. I have often heard the statement made that the Creator placed these organs in the fauces, and that they should not therefore be removed. It is scarcely necessary to say that enlarged tonsils are not the result of a creative intelligence, but of a diseased process. A reference might be made here to that very curious statement of Penrose[1] that tonsillotomy in childhood is sometimes followed by sterility in adult life. This point has been thoroughly discussed and answered by Daly,[2] Brandeis,[3] Hague,[4] Semon,[5] and others, in a somewhat serious vein. I have never taken this assertion of Penrose seriously, and am disposed to put it in the same category as that made by Rubio,[6] and indorsed by Taylor,[7] that the removal of the tonsils is liable to be followed by a hypochondriacal or suicidal tendency.

TREATMENT.—I think there can be little question that the prominent indication for treatment in this condition is the removal of the growth, and the main subject for discussion is as to the best means of accomplishing this end. I think we can easily understand the prejudice that exists against the use of the knife in these cases, when we consider that our patients are usually young children, and that the use of cutting instruments is oftentimes associated in the mind of a parent with excessive cruelty and suffering. Largely as a concession to this feeling on the part of a parent, I take it, the attempt has been made to dissipate these tumors by means of absorbents, astringents, and caustics.

We all recognize the almost specific action of preparations of iodine in producing absorption of lymphatic enlargements, but I think we must also recognize the fact that this action is limited to the earlier periods of hypertrophy, when the lymphoid bodies are soft, and the connective-tissue fibres are not thoroughly well organized. If now we bear in mind that the origin of these hypertrophies occurs at an exceeding early period of life, and furthermore that their development does not as a rule attain such proportions as to call for remedial interference until a considerable period has elapsed, I think we will appreciate the truth of the statement that when they are brought under observation, in certainly the very large majority of cases, the hypertrophic process has gone beyond the point when it is susceptible to the absorbent action of iodine. Hence, while acknowledging that something may be accomplished in the very early periods of life by its use, I question

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[1] As quoted by Daly, New York Med. Record, 1883, vol. xxiii., p. 146.
[2] Ibid. [3] Louisville Med. News, 1881, vol. ii., p. 304.
[4] Brit. Med. Jour., 1881, vol. ii., p. 193. [5] Loc. cit., p. 134.
[6] Siglo Med., Madrid, 1881, vol. xxviii., p. 777.
[7] Medical Times and Gaz., London, 1881, vol. ii., p. 758.

whether any practical reduction is accomplished by such application in the ordinary run of cases such as present for treatment. Its use, however, we must concede, is based on correct therapeutic principles.

The usefulness of astringents, however, which are advocated much more extensively in medical literature, is in my mind open to serious question. If we take into account the true pathological character of the changes which take place in the organ, I think we will be able to appreciate why an astringent should practically be almost useless. How, then, shall we explain the fact that their use has been indorsed by so many careful observers? In very many instances, and especially in younger patients, the tonsil is not only in a state of hypertrophy, but also in a state of chronic inflammation, characterized by swelling and notable hyperæmia, with possibly increased secretion. It is important that we recognize a distinction between these two conditions, for, while they are undoubtedly frequently met with in the same individual, there is no apparent connection between them. Now, while this tonsil is in a state of chronic inflammation, there can be no question that the use of astringents is of great value in reducing this process; and furthermore that their application results in a general reduction in the size of the organ, and at the same time in a diminution of the local symptoms to which its presence gives rise. The effect of astringents, I take it, therefore, is purely to reduce the inflammatory process, exerting no influence whatever upon the hypertrophic condition.

Perhaps the best of these local astringents is glycerole of tannin, applied daily by means of a camel's-hair pencil, either at the hands of the physician or an attendant; although we recognize the value in the same way of a solution of nitrate of silver, in a strength of from three to five grains to the ounce; sulphate of zinc, five to ten grains to the ounce; sulphate of copper, three grains to the ounce; or, as Ingals[1] suggests, the insufflation of powdered alum.

Practically, then, we regard the use of absorbents and astringents as inert in reducing true hypertrophy. Our conclusion, therefore, is that the successful treatment of these hypertrophies consists in their ablation.

Curiously enough, we still find many authorities advocating the use of caustics for their destruction. This is undoubtedly also a concession to the prejudice against the use of surgical measures. The methods of accomplishing this are by means of chromic acid, nitric acid, nitrate of silver, chloride of zinc, Vienna paste, and the potential cautery.

[1] Med. News, Phila., 1889, vol. lv., p. 339.

In using chromic acid, it is fused upon a slender probe and passed deeply into each crypt.

Nitric acid is applied by means of a glass rod or platinum probe.

Nitrate of silver is used in the solid stick, passing it over the surface and into the crypts.

Chloride of zinc is used in a saturated solution, by brushing over the organ and into the crypts by means of a pledget of cotton on a probe.

London and Vienna paste are simply applied to the face of the tonsil by means of a spatula.

The use of chemical agents for destroying these glands must be resorted to with a great deal of care, else neighboring tissues are in danger of being injured. At best it is an exceedingly slow process, each application giving rise to more or less discomfort from inflammatory reaction, the applications not being tolerated more than once in a week or ten days, and the whole organ rarely destroyed under from fifteen to fifty sittings.

These procedures I regard as rarely justifiable, not only owing to the length of time employed and the discomfort involved, but also because chemical caustics, where used for the destruction of tissue, usually result in the development of a somewhat obstinate cicatrix, which may be a source of no little discomfort to the patient afterward, and a condition is thus entailed which it is exceedingly difficult to eradicate.

In addition to the above, we find recommended injections of tincture of iodine, carbolic acid, and chloride of zinc. These measures are, I think, open to the same objection as the chemical caustics already alluded to, although probably they possess a certain amount of efficiency.

Under the potential cautery are to be included the Paquelin cautery, as recommended by Krishaber,[1] and the galvano-cautery, as recommended by Dodart,[2] Wright,[3] Valat,[4] Ruault,[5] Knight,[6] and Ouspenski.[7]

At the present day, one would scarcely think of using the actual cautery, nor when we consider the ease of manipulation of the galvano-cautery electrode, would resort, I think, be made to the Paquelin instrument. Most of the above-quoted observers unite

[1] Annal. des Mal. de l'Oreille, 1881, vol. vii., p. 125.
[2] Thèse de Bordeaux, 1888.
[3] Med. News, Phila., vol. lii., p. 332.
[4] Gaz. des Hôpitaux, 1888, vol. lxi., p. 1217.
[5] Union Médical, 1887, 3d series, vol. xliii., p. 813.
[6] N. Y. Med. Jour., vol. xlvi., p. 339.
[7] Annal. des Mal. de l'Oreille, 1888, vol. xiv., p. 342.

in recommending that in using the galvano-cautery a slender pointed electrode be chosen, and that a number of punctures be made with this instrument in the face of the hypertrophied organ, much better results being accomplished in this manner than by superficial burning. If it becomes necessary to resort to local destructive measures in the treatment of enlarged tonsils, this method undoubtedly is the one to which preference should be given above all others. At the best, however, we must anticipate a somewhat prolonged treatment. If the organs be notably enlarged, probaby from twenty to forty sittings, or even more, will be necessary. Considering, then, the length of time this treatment involves, and the discomfort which it entails upon the patient, it seems to me we should hesitate in any given case to resort to it, especially when we consider that the removal of these organs is really one of the simplest operations in surgery, and attended with practically no dangers whatever in children.

Tonsillotomy, I think, then, is the one measure of relief which should be advocated in all cases where consent is obtained, unless some special reason exists contra-indicating it. Excision of the tonsil may be done by the bistoury, the cold wire snare, the galvano-cautery écraseur, or the tonsillotome.

The use of the bistoury dates back to the time of Celsus,[1] and even at the present day we find many writers advocating its use, such as Bishop,[2] Ryerson,[3] St. Germain,[4] Elsberg,[5] and others.

Horace Green in his day probably excised more tonsils than any other operator, certainly in this country, unless perhaps we except Elsberg,[6] who claims to have removed eleven thousand. Green confined himself exclusively to the use of the bistoury in his practice.

In excising a tonsil with this instrument, it is necessary to seize the organ with a vulsellum or tenaculum, the tongue being depressed by means of a spatula in the hands of the patient or an assistant. The ordinary tonsil vulsellum is a double-bladed instrument with three curved hooks on either blade. I regard this as a dangerous instrument, and one which should never be used, in that its manipulation is exceedingly awkward. Moreover, it is very difficult to detach it if the operator so desires. St. Germain[7] seizes the tonsil with a pair of broad-bladed forceps, depressing the tongue with his finger, a gag having been inserted, and then excises the organ by a single sweep of the knife.

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[1] "De Medicina," cap. vii., sec. 12. [2] Brit. Med. Jour., 1882, vol. i., p. 265.
[3] Canada Lancet, 1883–84, vol. xvi., p. 337.
[4] La France Médicale, 1879, vol. xxvi., pp. 569 and 577.
[5] Trans. Amer. Laryng. Ass'n, 1881, p. 148. [6] Loc. cit. [7] Loc. cit.

It is often necessary, not only in this operation, but in examining the tonsil, to lift it from its bed. For this purpose I think no instrument is better than the ordinary slender uterine tenaculum.

I see no reason why the use of the bistoury is a more thoroughly surgical procedure, as is stated, than the use of the tonsillotome. Whatever measure accomplishes the desired end most successfully is the best surgery. Undoubtedly cases now and then occur, especially in adults, where the tonsil is flat and deeply imbedded between the two pillars in such a way, that the tonsillotome does not reach it. In these cases the bistoury may be required, although in such cases my experience is very decidedly in favor of the cold wire snare, and I very frequently resort to this instrument in the removal of small masses. The galvanocautery écraseur possesses the advantage that it accomplishes the extirpation of the tonsil without hemorrhage. In operating with it, the loop is adjusted accurately about the base of the growth and tightened, when, the current being turned on, the base of the tumor is burnt slowly through. This usually occupies from ten to fifteen minutes. It is therefore a slow procedure, and one which will be found exceedingly difficult to apply, especially in the case of a child, unless a general anæsthetic be given. In an adult, however, I think there can be no question but that this device presents certain advantages, because I believe hemorrhage in an adult to be a danger always to be anticipated in removing tonsils, and one which occurs in quite a large proportion of cases. Potter[1] makes the very excellent suggestion, in removing tonsils by this method, that the loop should not be adjusted too deeply, because, in the process of burning through, a certain amount of tissue is destroyed beyond the cut surface, which comes away in the form of slough subsequently. Knight[2] also makes the suggestion that, after the platinum loop has been placed behind the tonsil, the current be turned on for an instant, burning a small groove in that portion of the organ, thereby securing the posterior loop in place and preventing its slipping off, while tightening the wire anteriorly.

After all that has been said in favor of the various devices already discussed, there is still no question in my mind that by far the best method of removing the tonsils, in the very large majority of cases, is by means of the tonsillotome. This consists practically of a ring-shaped knife, which is adjusted over the hypertrophied organ, and by a quick and simple mechanism enables the operator to remove the mass almost instantly. The advantage of this device is that the manipulation is practically unhampered by restlessness

[1] Med. News, Phila., 1888, vol. lii., p. 255.
[2] N. Y. Med. Jour., 1889, vol. l., p. 398.

and struggling on the part of the child, the only requirement being that the mouth shall be kept open sufficiently long for the instrument to be adjusted over the tonsil. The operation is a comparatively simple one, and yet is one that requires a certain amount of manipulative skill. After an operator, however, has acquired this skill, it is a very rare event to meet with a patient in which the tonsils cannot be successfully excised, in spite of struggling or resistance, and that too without resort to a general anæsthetic.

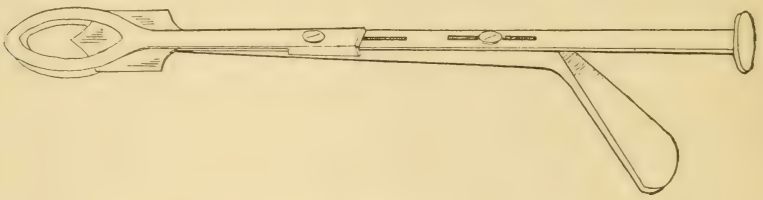

Fig. 15.—Physick's Original Tonsillotome.

To Physick[1] is due the entire credit, I think, of having originated a device for the removal of these growths, although, according to St. Germain, the idea first occurred to Desault. Physick's instrument (see Fig. 15) was probably based on a similar device which Bell[2] constructed for the amputation of the uvula. It consisted of a broad flat steel plate, with an oval opening in its distal extremity sufficiently large to receive the tonsil. To this was attached a knife, secured by lateral grooves, so adjusted that in pushing it forward across the fenestra it would amputate as much of the tonsil as projected through the opening. Fahnestock[3] subsequently modified this instrument by substituting for the single

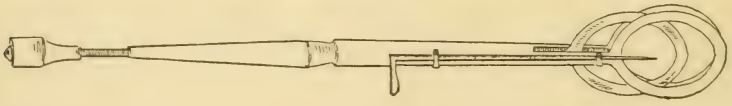

Fig. 16.—Fahnestock's Original Tonsillotome.

plate two circular rings mounted on a shaft, containing between them a concealed ring knife, sharpened on its inner edge (see Fig. 16). This was so arranged that, after adjusting the circular ring upon the tonsil, the concealed knife was drawn forward, and that portion of the tonsil excised which projected into the opening.

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[1] Amer. Jour. Med. Sciences, vol. i., p. 262. This instrument was originally designed for amputating the uvula, in a special case, although Physick suggested that it might be of value in excising tonsils.

[2] "System of Surgery," 1783, vol. iv., p. 144, plate 52, fig. 1.

[3] Amer. Jour. Med. Sciences, 1832, vol. xi., 248.

Velpeau added an exceedingly important detail to the instrument by adjusting the sliding rod, terminating in a lance point, in such a way that the tonsil could be lifted from its bed before the ring knife was drawn home for its excision.

Guersant[1] subsequently modified the instrument by changing the rounded opening to an antero-posterior oval. Thus far the instrument required two hands for its manipulation, one to hold the instrument in place, while with the other hand the knife was manipulated. Maisonneuve modified the instrument by placing a handle on the inside of the shaft, and attaching a ring to the knife rod. In this way, the instrument being grasped in the hand, the lance was pushed forward by the thumb, and the knife drawn home by the middle and index fingers. Carrying out Maisonneuve's idea, the tonsillotome seems further to have been perfected by the instrument-makers Charrière and Mathieu, resulting in the pro-

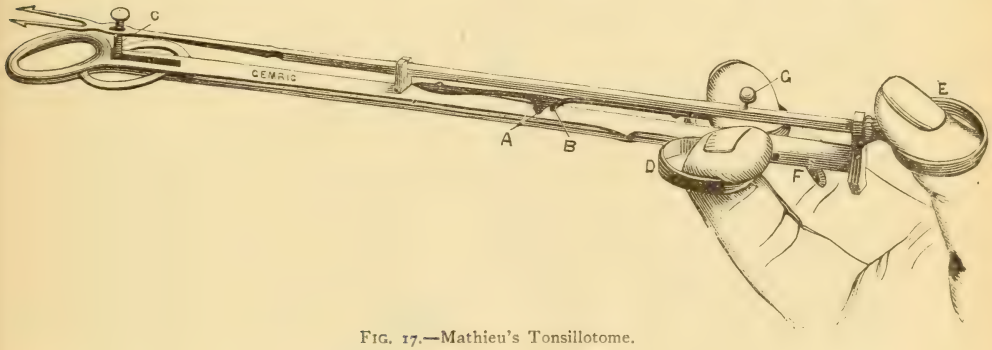

FIG. 17.—Mathieu's Tonsillotome.

duction of the device shown in Fig. 17. One of the changes made here consists in having the long diameter of the opening vertical instead of antero-posterior, thus better adapting it to the shape of the very large majority of enlarged tonsils. For Maisonneuve's handle is substituted the two rings on either side of the shaft of the instrument, attached to the ring knife, while the thumb is inserted into a ring at the proximal end of the lance. A somewhat ingenious little piece of mechanism is arranged at the distal end of the lance shaft, by means of which the tonsil is first pierced, and subsequently drawn out from its bed.

This instrument is not only exceedingly simple in its mechanism, but perfect in its action beyond any other device with which I am familiar. Being held by the three fingers, as shown in the cut, after it is adjusted in position, by simply approximating the three fingers the lance is first driven home and the knife drawn forward in such a way as to cut through the hypertrophied tonsil,

[1] "Hypertrophie des Amygdales," Paris, 1864.

while at the same time the amputated portion is held on the distal extremity of the lance, and is removed with the instrument.

I think this instrument leaves absolutely nothing to be desired in the way of a tonsillotome, on account of the ease and facility with which it is manipulated. Especially is it valuable, I think, on account of the shape of its distal extremity, in that the slender oval ring is inserted into the mouth and fitted around the tonsil more readily and more perfectly than in any other device.

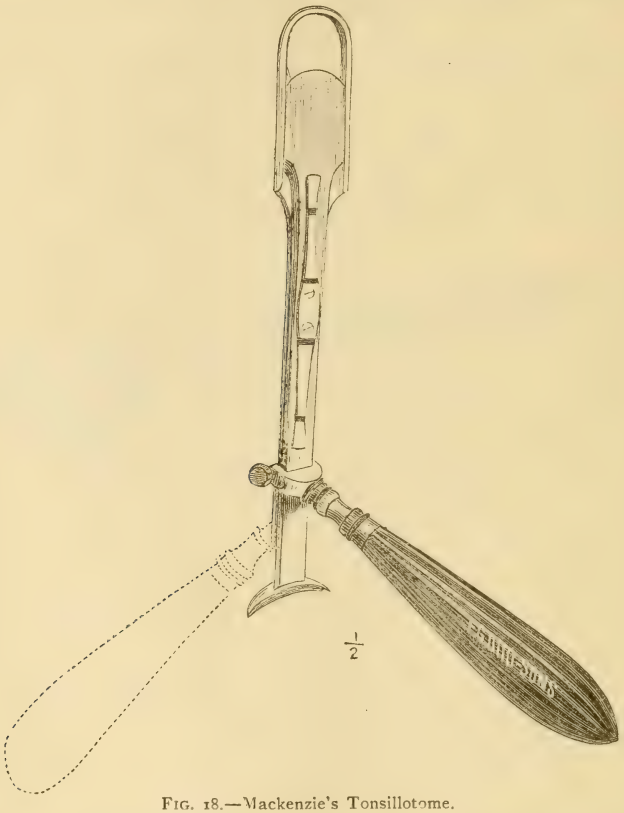

FIG. 18.—Mackenzie's Tonsillotome.

Mackenzie has modified the Physick instrument by attaching an adjustable handle to its proximal extremity, as seen in Fig. 18. In amputating a tonsil with this instrument, there is no device for securing the mass after excision. This perhaps is not a serious objection, in that it is easily expelled after the operation; but the great objection I find in Mackenzie's instrument is that the long diameter of the oval opening is antero-posterior, which is not the shape of the base of the hypertrophied gland. In the Mathieu instrument we have a small rounded ring attached to a slender shaft; in the Mackenzie instrument there is the broad blade, which renders it more bulky than the Mathieu instrument, and therefore

of course less easily manipulated. Furthermore, an instrument held by the three fingers, as in the Mathieu tonsillotome, presents a far more convenient and easily manipulated device than one held in the full grasp of the hand.

Recognizing the fact that for a thorough removal of the diseased tissue the opening in the extremity of the instrument should conform as nearly as possible to the size of the tonsil, Sexton[1] has modified Mathieu's instrument by making a joint in its shaft, to which different sized knives and rings can be fitted by a simple mechanism. Stoker[2] has modified Mackenzie's instrument in a similar manner. These devices, of course, possess the advantage of economy. Any one, however, who is called upon to do this operation frequently must necessarily be provided with at least three tonsillotomes of various sizes. For many years past all my work in this direction has been accomplished by four instruments, in which the oval openings measure as follows: ¾ in. x ⅝ in., ⅞ in. x ¾ in., 1 in. x ⅞ in., and 1⅛ in. x 1 in.

In addition to this, we find in the instrument-makers' stock a large number of devices for the removal of the tonsils. Practically, however, I think the very large majority of those engaged in special throat work confine themselves to the use of either the Mackenzie or the Mathieu instrument. As before stated, my own preference is for the latter, on account of its lightness, facility of manipulation, and from the fact that the long diameter of its oval opening is vertical. A still greater advantage of the Mathieu instrument lies in the fact that it is manipulated by the right hand with equal facility in operating on either tonsil; whereas the Mackenzie instrument is manipulated with the right hand in the removal of the left tonsil, and *vice versa*.

In operating, the patient being in a sitting position, the tongue is easily depressed by a spatula in the left hand, while the tonsillotome, held in the right hand, is passed back into the fauces until its oval opening is directly opposite the tonsil, when it is carried down into the sulcus between the base of the tongue and the faucial arches, the plane of the opening being about an angle of 45 degrees. After the lower segment of the opening has passed around the lower portion of the tonsil, the instrument is then swung upward and outward until the enlarged organ projects through the opening and the ring of the tonsillotome is seen to thoroughly encircle the tonsil at its base. After the tonsillotome is in place, it is as a rule, I think, impossible for even young children to displace it by any involuntary movements of the fauces. Hence, while the

[1] Trans. of Amer. Otological Soc., 1884, vol. iii., part iii., p. 321.

[2] Brit. Med. Jour., 1882, vol. ii., p. 137.

movement already described should be accomplished as rapidly as possible, the further procedures can be done with a certain amount of deliberation, in order to secure the thorough extirpation of the diseased mass. After the instrument is in place, then, the spatula may be dropped from the left hand, and the shaft of the instrument should be grasped by it, in such a way as to press it firmly into place, while at the same time the shaft of the instrument is quickly swung up and down through a small arc of a circle, of which the tonsil is the centre, thus working the ring of the instrument well down to the base of the gland, when, by a quick contraction of the fingers of the right hand, the peculiar mechanism of the instrument is brought into play and the tonsil cut through.

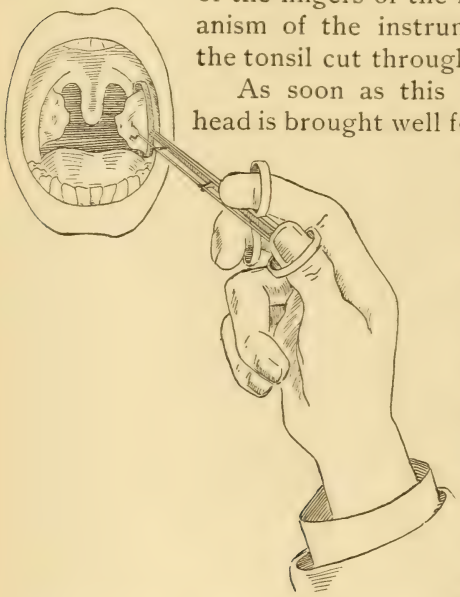

FIG. 19.—Method of using Mathieu's Tonsillotome.

As soon as this is accomplished, the patient's head is brought well forward, so that the blood which follows the cut may make its escape through the mouth rather than into the fauces.

The procedure described above is quite successful in the very large majority of instances, as after the introduction of the spatula, which is grasped in the manner already described,[1] the tongue is depressed, the mouth kept well open, and the movements of the head prevented by the firm grasp of the fingers of the left hand beneath the chin of the patient.

Of course the above procedure is accomplished with the consent of the patient. Where we have to deal with refractory children, I have always declined to use any force other than that described in the following plan of procedure: the thumb, being enveloped in several folds of a thick towel, is inserted between the teeth of the child, and forced backward between the molars, thus holding the mouth well open, while at the same time the lower jaw is grasped firmly between the thumb and the first two fingers. In this way the movements of the head are perfectly controlled. The Mathieu tonsillotome is then used to depress the tongue, while at the same time it is carried back into the fauces. When it is opposite the tonsil, it is passd down into the sulcus between it and the base of

[1] Vol. i., pp. 22 and 23.

the tongue, swung on to the mass, and the operation completed in the same manner as previously described.

Passing the instrument over the lower portion of the tonsil is, I think, important, in view of the fact that in many instances the hypertrophied mass is to a certain extent pendulous, and presents a lower lobe, which hangs down, as it were, into the fauces, below its attachment; hence, if the instrument were put on from above downward, it would sever but a portion of the diseased tissue; while, applied in the manner described, the whole of the mass is embraced within the ring.

It has been already pretty clearly shown that I regard the removal of the whole of the enlarged organ as almost imperative, in that the whole mass is made up of diseased tissue, and if any portion is left, it is liable to become the source of irritation, and at times of troublesome symptoms. And yet we find Semon[1] condemning the total extirpation of the organ as dangerous and superfluous, while a recent medical dictionary[2] defines the tonsillotome as "an instrument for slicing off a portion of the tonsil." No one will deny that the whole of the organ is diseased, and, furthermore, any possible function which this lymphatic tissue has to perform in the economy is completely abolished by this morbid condition. Hence we have practically to do here with a neoplasm. If we remove a portion of it, we undoubtedly afford a certain amount of relief; but any portion of the structure which is left cannot but act as a source of local irritation, and also as a mechanical hindrance to the normal functional movements of the faucial muscles. I am convinced, therefore, that we have not done our duty in these cases until we have completely extirpated the organ as far as possible. This conviction is based not only on the ground above advanced, but on a very large number of cases which have come under my observation, wherein the partial removal of the tonsils has given rise to but a limited amount of relief to symptoms. In my own work, I never feel thoroughly satisfied in having done an operation of tonsillotomy unless, after the removal of the organ, I see the cut surface drop back between the pillars of the fauces in such a way as that these parts return to their normal position, and practically no trace is left of the pre-existing diseased organ. Of course this is not accomplished in every case, but I think it is a result to be desired.

In describing the operation, I have advised the crowding in of the tonsillotome upon the mass so as to engage as much tissue as possible. For the same purpose it is well also to make use of external pressure. I do this, on the ground that with the Mathieu instru-

[1] Loc. cit., p. 155. [2] "National Med. Dic.," Phila., 1890.

ment it is absolutely impossible to engage structures which should not be removed. Neither this instrument nor any other device is capable of thoroughly extirpating the tonsils in every instance. If, therefore, any portions are found remaining after the use of the guillotine, I think they should be removed at the same sitting by means of the cold wire snare.[1] If both tonsils are diseased, as is the rule, I know of no reason why they should not both be extirpated at the same sitting; indeed, I have occasionally removed both at the same time, without removing the spatula from the mouth. This, however, requires quick manipulation, and a considerable degree of self-control on the part of the patient.

After the operation, if the organ has been thoroughly extirpated, in many instances relief follows almost immediately, and the patient is conscious of no further symptoms referable to his throat, although for perhaps an hour after the operation there is a bruised and sore feeling about the parts. In other cases, there is an exudation on the cut surface, which I regard as practically much the same as an ordinary attack of croupous tonsillitis. A white membrane forms, there is more or less inflammatory trouble, with pain in swallowing, together with febrile disturbance. This condition lasts from four days to a week, and disappears spontaneously. If the symptoms are severe, it should be treated as an ordinary croupous tonsillitis.

The operation is not especially painful, although rather terrifying to young children. I know of no objection, therefore, to removing tonsils without a general anæsthetic, provided one can gain sufficient control of the patient. It is better, moreover, that the patient should retain consciousness, and thus be enabled to expel the blood which flows after the operation. It will occasionally be necessary to administer a general anæsthetic, and for this purpose I have been accustomed for years to resort to the use of chloroform. Complete anæsthesia is not necessary, all that is required being a sufficient relaxation to prevent resistance on the part of the child. In carrying out the procedure, perhaps half a drachm of chloroform, poured on to a handkerchief and held firmly over the child's mouth, is all that will be required, while at the time the child is held in the arms of an assistant. I have rarely found it necessary to charge the handkerchief with the anæsthetic a second time.

As soon as the tonsils are out, the child is laid prone on a sofa, with the head projecting over, and the blood allowed to drip into a bowl.

As already stated, I do not think tonsillotomy a painful opera-

[1] Vol. i., p. 404, fig. 108.

tion, and yet I think where a general anæsthetic is not used, it is our duty to secure such immunity from pain as the local application of cocaine affords. A twenty-per-cent solution of this drug, brushed over an enlarged tonsil from three to five minutes before its excision, diminishes the pain of the operation, but does not completely ablate it. The injection of cocaine into the tonsil will undoubtedly secure complete anæsthesia, but the use of this drug by the hypodermic method in the upper air passages undoubtedly involves a certain risk to the patient.

I believe the operation of tonsillotomy is practically one unattended with danger.

Cornil[1] states, as a result of his histological investigations, that, relatively to the size of the organ, its blood supply is diminished in hypertrophy. From a clinical standpoint, however, I think we must recognize the fact that, if the organ has attained a considerable size, there is sufficient vascularity to become the source of no inconsiderable hemorrhage after cutting. As a rule, immediately following the removal of the organ there is a gush of blood, which is profuse in amount. This usually lasts, however, but a very short time, and ceases in the course of twenty or thirty seconds. In other instances, however, it persists, and may become not only troublesome, but alarming, and even dangerous to life. In most instances, the excessive hemorrhage comes on immediately after the operation, while in other cases there may be a trifling hemorrhage at the time, and a secondary hemorrhage occurring some hours later may prove a grave complication. Thus Nélaton[2] reports a case of tonsillotomy in a lad, in whom the hemorrhage only became troublesome forty hours after the operation. It ceased, however, spontaneously. In another case, it came on six hours after the operation and was only controlled by a clamp similar to Clendenin's. The same observer refers to a case reported by St. Yves in which the hemorrhage came on four days after the operation.

Hood[3] reports two cases of tonsillotomy in adults in which troublesome hemorrhage set in immediately. In his first case, the flow of blood into the stomach at the end of two or three hours brought on vomiting, which seemed to arrest the hemorrhage almost instantly. As the result of this experience, he administered an emetic of sulphate of zinc in his second case, with an equally favorable result.

In a case reported by Billroth[4] the operation on an adult was followed immediately by a most profuse hemorrhage, which was

[1] Loc. cit.
[2] Gaz. des Hôpitaux, 1857, p. 570.
[3] Lancet, Lond., 1870, vol. ii., p. 600.
[4] Lancet, Lond., 1870, vol. ii., p. 747.

only arrested by pressure on the carotid. In this case, as in Hood's and probably Nélaton's, the operation was done by means of the bistoury. In the former case the source of the hemorrhage is not stated, although, in the latter, Billroth considers its source to have been in the faucial pillar which was incised by his knife.

Liden[1] also reports a case of excision of the tonsil in an adult by means of the bistoury, which was immediately followed by hemorrhage, which became so profuse and persistent as to necessitate ligature of the common carotid artery. Liden attributed the hemorrhage to an abnormal distribution of blood-vessels.

In a case reported by Semon,[2] of a woman aged forty-six, a persistent hemorrhage which set in was arrested by direct pressure. In a second case by the same observer,[3] that of a woman aged twenty-three, the blood seemed to ooze from the whole face of the tonsil, and was arrested spontaneously, only after an excessive loss of blood, and, according to the observer, by reduced general arterial pressure. The tonsillotome was used in both these cases.

In a case reported by Downey[4] a troublesome hemorrhage came on four hours after the operation, and persisted for twelve hours, notwithstanding the application of various styptics, such as perchloride of iron, etc., and was finally arrested by the actual cautery.

It is interesting to note here, in connection with Hood's cases, that twice the hemorrhage was temporarily arrested, during this period, by vomiting brought on by the presence of blood in the stomach.

Lefferts[5] reports having observed four cases of troublesome hemorrhage. His first case was a man aged twenty-five, in whom the bleeding came on an hour or so after the operation, and was only arrested by direct pressure. The operation was done by the bistoury. His second case was that of a man aged thirty-five, in whom the right tonsil was excised by Mackenzie's tonsillotome. Hemorrhage set in immediately, and persisted for three days, being temporarily arrested by applications of persulphate of iron. On the third day, a spurting artery was discovered, into which a stick of nitrate of silver was inserted without effect. The bleeding was then permanently arrested by torsion.

In two other cases, both adults, hemorrhage followed immediately the use of the tonsillotome. The source was in each case a spurting artery, and was arrested by torsion.

[1] Schmidt's Jahrbuch, 1880, vol. cxxxvii., p. 172.
[2] St. Thomas' Hosp. Reports, 1882, p. 85.
[3] Ibid., 1883, p. 153.
[4] Edin. Med. Jour., vol. xxxii. [1], p. 116.
[5] Trans. Amer. Laryng. Ass'n, 1881, p. 135.

Blair[1] performed a double tonsillotomy in a young man aged twenty-one, which was followed immediately by hemorrhage from the left side, which, after the failure of cocaine, nitrate of silver, sulphate of iron, etc., was only controlled by pressure, maintained persistently for three hours. Four hours later, the hemorrhage recurred, and was then permanently controlled in the same manner. A second case is reported by the same observer, in which the hemorrhage immediately followed the operation in a man aged twenty-seven. The details of the case were almost identical with his first. It is interesting to note here that in both these cases Blair injected in one case a ten-per-cent and in the other a twenty-per-cent solution of cocaine before the operation, in order to produce anæsthesia. Blair seemed to think this may have been responsible for the hemorrhage. According to my observation, the contractile effect of cocaine upon the blood-vessels usually persists from half an hour to an hour or even longer, and, moreover, when the effect wears off, the blood-vessels resume their normal calibre and nothing more. This drug, I think, therefore, can scarcely be held responsible for any hemorrhagic accidents.

A somewhat curious and rather suggestive case has been reported by Fuller,[2] who removed the right tonsil in a young man of twenty-five. The bleeding at the time was easily controlled by the use of the gallic and tannic acid gargle, of the London Throat Hospital. Seven hours later, profuse hemorrhage came on. The above-mentioned gargle, ice, styptics, pressure, hot and cold water, and various other measures were resorted to, without avail, the hemorrhage persisting for thirteen hours and a half, when the common carotid artery was ligated above the omo-hyoid muscle. Notwithstanding this resort, hemorrhage was not controlled, and seems to have ceased spontaneously three hours later. The failure of the ligation to arrest the hemorrhage, of course, is only to be accounted for here by an unusually rich distribution of the anastomosing vessels.

In a case reported by Delavan[3] hemorrhage came on an hour after tonsillotomy in a man aged thirty-four. All the ordinary measures were tried, without avail, and the bleeding seems to have ceased spontaneously. The same observer reports having seen seven other cases somewhat similar to the above, all of whom were adults.

Wagner[4] reports a case of hemorrhage immediately following

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[1] Albany Medical Annals, 1888, vol. ix., p. 41.

[2] Am. Journal of Med. Sciences, 1888, vol. xcv., p. 357.

[3] Trans. Am. Laryngological Ass'n, 1888, p. 155.

[4] New York Med. Jour., vol. xlv., p. 434.

tonsillotomy in a woman aged thirty, which was traceable to a spurting blood-vessel, and was easily arrested by torsion.

A somewhat unique procedure was resorted to by Clarke[1] in controlling a hemorrhage which came on an hour after tonsillotomy in a man aged twenty-two. Both tonsils were removed, but the bleeding was on the left side. The usual measures all failing to afford any relief, the stump was seized by a pair of vulsellum forceps and dragged forward, thus enabling the operator to ligate the mass.

Gay[2] reports two cases, in which alarming hemorrhage came on immediately after tonsillotomy in female patients aged respectively twenty and twenty-three. Ice, sulphate of iron, and the ordinary styptics failing, the bleeding was arrested, in one case, by a sponge saturated with creosote, and in the other by a sponge saturated with vinegar, pressed upon the bleeding surface.

Levis[3] reports having seen three cases of hemorrhage following tonsillotomy in adults. In one case it was arrested by pressure, and in the other two by a swab charged with perchloride of iron.

Other instances of this complication of tonsillotomy have been reported by Daly,[4] Sajous,[5] Lewis,[6] and Jarvis[7] in which the hemorrhage was arrested by pressure, torsion, or ceased spontaneously. Jarvis' case is interesting from the somewhat novel method of operating. The mass being too large for removal by the tonsillotome, he took a piece of sheet brass, and cut an opening in it sufficiently large to admit the tonsil, and then sliced off the projecting mass by the bistoury.

In my own practice I have met with quite a number of cases of alarming and troublesome hemorrhage from tonsillotomy, all in adults. None of these, however, present any points of special interest, with the exception of perhaps one. This was the case of a gentleman aged thirty-one. I removed an unusually large tonsil from the left side with the Mathieu guillotine, whereupon there followed a hemorrhage of so violent a characeter that any manipulation was rendered absolutely impossible. The blood poured from his throat in a stream. At the end of about three minutes syncope ensued, and the hemorrhage ceased instantly and did not recur. The amount of blood lost was from eighteen to twenty ounces. This patient was confined to his bed for a number of days, and did not fully recover his strength for several weeks.

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[1] New York Med. Jour., vol. xlviii., p. 7.

[2] Buffalo Med. and Surg. Jour., 1883, vol. xxii., p. 446.

[3] Brit. Med. Jour., 1888, vol. ii., p. 613.

[4] New York Med. Record, vol. xxiii., p. 148.

[5] "Diseases of the Nose and Throat," Philadelpnia, 1886, p. 293.

[6] Journal of Ophthalmology, Otology, and Laryngology, 1889, vol. i., p. 115.

[7] Jour. of the Am. Med. Ass'n, 1883, vol. i., p. 17.

I have thus collated such cases of this accident as are found in current literature, with a brief *résumé* of the salient points of each, because I regard the question as one of considerable importance. Moreover, the *résumé* above given establishes a number of facts which heretofore have not been sufficiently accepted. The first and most important fact which is to be observed here is that every one of these cases occurred in adult life. Indeed, I know of no recorded instance where dangerous or even troublesome hemorrhage followed tonsillotomy in childhood, with the single exception of that reported by Capart.[1] This was a case in which the tonsil was excised by means of the galvano-cautery loop, in a child eight years of age. This was followed by hemorrhage, which persisted for five days. The case is certainly unique, and the question arises whether the source of hemorrhage may not have been in an injury to the faucial pillars, the persistence of the bleeding being the result of the constant movements of the part.

Excluding this case, the rule is universal that the danger from hemorrhage belongs to adult life. I am disposed to go further than this and say, if the tonsil is one of any magnitude, its excision is an operation which is exceedingly liable to be followed by troublesome hemorrhage in probably the larger proportion of cases in adult life. Indeed, as the result of former experiences, I never undertake an operation in adult life without apprehension, and without being prepared for emergencies.

A second point which I think is fairly well established by the cases above reported is that, while hemorrhage may be an exceedingly troublesome accident, it is not a complication which is dangerous to life, for, although we see somewhat vague references now and then in literature to death from this cause, I know of no case reported in sufficient detail to warrant its being accepted as such.

I think our cases still further show very clearly the total inefficacy of the ordinary remedies which are classified as styptics, hæmostatics, etc. Of the whole list of cases which we have quoted, we find no instance in which the hemorrhage seems to have been arrested either by gallic acid, ice, sulphate or perchloride of iron, or any of the ordinary styptics so called. The only instance in which these remedies seem to have had any effect, were those reported by Gay, wherein the bleeding was arrested in one case by vinegar and in the other by creosote applied by means of a swab. I think we are justified in concluding that the hemorrhage was arrested here by pressure, rather than by any specific action of the drugs used.

If, now, we examine these cases to see what measures have been

[1] Trans. du Congrès internat. de Laryng., Milan, Sept., 1881, p. 96.

effective, we will find that in quite a large proportion of cases the bleeding ceased spontaneously. In those cases where the parts could be brought under easy inspection and the source of the hemorrhage traced to a spurting artery, it was successfully arrested by torsion. The remaining cases were arrested by pressure, with the exception of those in which the carotid was tied.

Our first impulse, naturally, in being confronted with a case of hemorrhage after tonsillotomy, is to immediately apply some preparation of iron or tannin. The futility of this has been clearly demonstrated. Indeed, I consider it a somewhat objectionable practice, in that, while failing to arrest hemorrhage, it not only irritates the fauces, but fills them with a mass of coagulated blood and iron, which conceals the parts from view and hampers further manipulation.

Our first duty, therefore, is to examine the parts carefully, in order to detect, if possible, the source of hemorrhage. If this is found to be a spurting artery, this will usually be, I think, the tonsillar artery, which, according to my experience, presents at the junction of the lower third with the upper two-thirds of the cut surface. If this is found, an attempt should be made to arrest it by torsion. This measure failing, or the source of blood being in an oozing from the whole surface, two measures are open to us—the use of the actual cautery, or pressure. A simple method of pressure which is available in many cases consists in wrapping two or three folds of a light handkerchief about the thumb, and inserting it into the fauces, thus grasping and holding the bleeding surface between the ball of the thumb in the inside, and the forefinger applied behind the ramus of the jaw. The objection to this is that it may be necessary to maintain the pressure for several hours (in Blair's case for three hours) before the bleeding is arrested, which is somewhat of a tax to the endurance of the surgeon. As obviating this difficulty, Clendenin[1] has devised an instrument which accomplishes the same purpose. It consists of two long jointed arms, mounted with pads at their distal extremities, and so arranged that one pad can be adjusted to the bleeding surface, while the other is adjusted to the cervical region externally. It is fitted with a screw for regulating the pressure. Pressure by the thumb or by Clendenin's instrument is not always tolerated by the patient, on account of the retching which is excited. To overcome this a full dose of morphine may be administered hypodermically, or in an extreme case I see no objection to a few whiffs of chloroform.

The above measures failing to arrest the bleeding, the next re-

[1] The Med. Gaz., New York, 1883, vol. x., p. 172.

sort, I think, should be to the use of the actual cautery, and for this purpose I think the best effect is obtained from the use either of the heated irons or from the Paquelin cautery. The galvano-cautery electrode is so small that its heat is rapidly dissipated when applied to a profusely bleeding surface, and its hæmostatic powers are thus impaired. The Paquelin cautery can be maintained at the proper hæmostatic heat, viz., a dull red heat, and is not only easily regulated, but affords an abundantly broad surface for burning the bleeding tissues. If the Paquelin instrument is not available, heated irons should be used. It is necessary that these should be of such size that the heat will not be rapidly dissipated by the flowing blood.

As a final resort, ligature of the carotid artery may be successful if demanded. I think that we must regard the failure of this resort in Fuller's case as an accident not to be anticipated. It seems to have been entirely successful in Liden's[1] case, and also one of McCarthy's, which is referred to by Mackenzie[2] without detail.

The reasons for ligating the common carotid, in preference to the external branch, are not quite clear, unless perhaps that it is a simpler operation. Lefferts[3] takes the ground that it would be better to ligate the external carotid, from which arises the ascending pharyngeal and indirectly the tonsillar arteries. The same measure is advocated by Zuckerkandl.[4] Delavan[5] makes the still further point that, after ligature of the common carotid, hemorrhage from the tonsil may be re-established by blood making its way from the opposite side through the circle of Willis and down in a reverse direction through the internal carotid into the external. The point is well taken, and yet I know of no cases in which the operation has been done, and, as we have seen, the common carotid has been ligated but three times. From an anatomical point of view, it seems clear that if ligature of the external carotid fails to arrest the hemorrhage, the next step should be to tie the common carotid, and finally, if necessary, the internal carotid. In this manner, of course, all blood supply is absolutely shut off from the tonsillar region.

While, therefore, I have discussed the danger in tonsillotomy fully and at length, as the subject demands, I am of the opinion that troublesome hemorrhage can be avoided in the large majority if not in all cases. Recognizing the fact that the operation in adult life is exceedingly liable to be followed by excessive hemorrhages if cutting instruments are used, I have for a number of years confined myself

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[1] Loc. cit. [2] "Diseases of the Throat and Nose," Am. ed., 1880, vol. i., p. 86.
[3] Loc. cit. [4] Wien. med. Jahr., 1887, vol. vi., pp. 309–327. [5] Loc. cit.

to the use of the snare exclusively when a patient has passed the age of puberty. The instrument which I use is shown in Fig. 20. It is a modification of the ordinary polypus snare (see Fig. 108, Vol. I.) which goes under the author's name, but is of much stouter

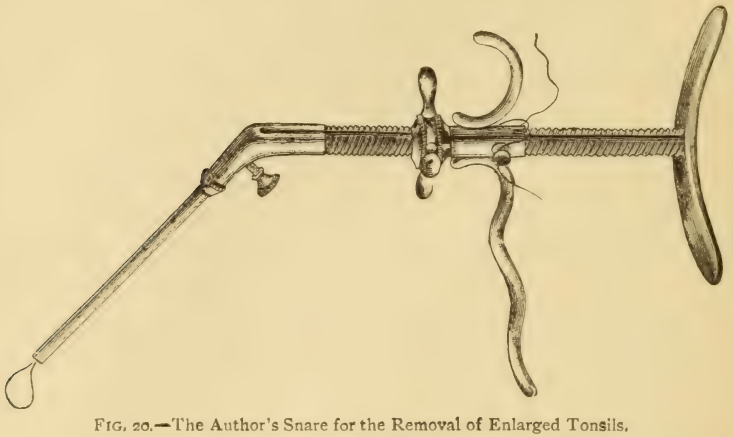

FIG. 20.—The Author's Snare for the Removal of Enlarged Tonsils.

construction. Its mechanism is easily appreciated by a reference to the cut. The wire to be used is No. 10 steel piano wire. The loop, having been adjusted over the mass, is drawn home as far as possible by the hand, after which the operation is completed by the écraseur screw. In many cases the operation is finished without using the écraseur; but if the tonsil is large and the patient beyond early adult life, the use of the screw will be necessary. The instrument has worked admirably in all my cases, and in no single instance has the hemorrhage been more than of the most trivial character.

CHAPTER XII.

CROUPOUS TONSILLITIS OR ACUTE FOLLICULAR TONSILLITIS.

THIS affection has been the subject of considerable interest in past years, and is usually described in literature as an acute follicular tonsillitis. In our discussion of inflammatory affections in the air passages, we have endeavored to establish a well-defined classification, in which the name of the disease should define, as far as possible, its pathological character. In the disease under question, we consider that the local manifestation consists of a fibrinous exudation or, in other words, a croupous inflammation involving the lining of the crypts of the tonsil. We adopt, therefore, the name of croupous tonsillitis in preference to that of acute follicular tonsillitis, in that, according to the classification adopted, the latter name properly would define a catarrhal inflammation.

We find some obscure references to this affection in most of the older works, especially those treating of the diseases of child life. These references, however, are usually vague and indefinite in character, describing the disease as a form of catarrhal angina or tonsillitis. In the early part of the century, Mayenc makes casual allusion to it; but, as far as I know, the first description of it as a distinct disease was given in my earlier work,[2] where the subject was discussed somewhat at length. In the works on diseases of the throat which appeared subsequent to this volume, the affection was still referred to only in an obscure way, in the discussion of the general subject of tonsillitis. In the periodical literature, however, of the past ten years, we find contributions to our knowledge of the affection by Prince,[3] Haberkorn,[4] Raven,[5] Potter,[6] Cardew,[7] Atkinson,[8] Jacobi,[9] Dubousquet-Laborderie,[10] and others.

[1] Bull. de la Faculté méd. de Paris, 1819, vol. vi., p. 396.
[2] "Diseases of the Throat and Nose," New York, 1881, p. 123.
[3] Boston Medical and Surgical Journal, 1882, vol. cvi., p. 101.
[4] Centralblatt für Chir., 1889, vol. xvi., p. 553.
[5] Practitioner, 1887, vol. xxxviii., p 316.
[6] Buffalo Medical and Surgical Journal, 1887–88, vol. xxvii., p. 455.
[7] Brit. Med. Journal, 1884, vol. i., p. 600.
[8] Practitioner, 1884, vol. xxxiii., p. 198.
[9] New York Med. Record, 1886, vol. xxx., pp. 593 and 609.
[10] Gaz. des Hôpit., 1887, vol. lx., p. 83.

Most of these writers describe the affection as an acute follicular tonsillitis or amygdalitis, while a few use the term infectious tonsillitis.

ETIOLOGY.—This disease was formerly regarded as a purely local affection. Latterly, however, I think all agree with the view taken in my earlier work, that it is a systemic disease or blood-poison, characterized by a local manifestation in the fauces, this latter bearing something of the same relation to the systemic disorder as the eruption in small-pox, for instance, does to the continued fever. In other words, we may, in a sense, regard it as one of the exanthemata, bearing a close relation to them in all its features, with the possible exception that it is not to be regarded as a contagious disease. This statement, of course, naturally involves the further assertion that it is to be classed as one of the germ diseases. My own view of its origin is that the germ, floating in the atmosphere, comes in contact with the ragged surface of the tonsil, and is entangled in the crypts, and from thence either makes its way into the circulation or, remaining localized at the seat of infection, gives rise there to those changes in the blood which create general febrile disturbance. At the same time a local inflammatory process of a peculiar character, viz., a croupous inflammation, is set up at the point of entrance.

What the source of the germ is, of course, can only be a subject of speculation. Clinical observation, however, teaches us that its probable source is in some of the various microbes which attend the processes of decomposition which take place in the conduits, which carry off the waste matter of our houses, viz., the sewers. This fact has been clearly established, I think, in numberless cases and by many observers, who have directly traced an outbreak of croupous tonsillitis to a broken sewer pipe.

When we come to discuss the question whether this germ is a specific germ, we open too wide a field for speculation. I am disposed to think that it is scarcely necessary to regard the germ as specific, and that all the clinical questions which suggest themselves to us, in observing a case, are sufficiently answered when we recognize the fact that the germ only becomes a specific one when it comes in contact with the tissues of the tonsil, and that the chemical changes which take place there only render it so. The research for the definite germ made by Fränkel[1] and Gabbi[2] has given no positive results.

While undoubtedly in most instances the infecting germ makes its way into the air passages through the air, it is altogether prob-

[1] Berliner klin. Woch., 1886, vol. xxxiii., pp. 245 and 287.

[2] Lo Sperimentale, Florence, 1889, vol. lxiii., fasc. 4, p. 388.

able that it may be conveyed in other ways. Thus, Cotterill has recorded an epidemic which broke out in a boys' school. Its source was traced to milk from cows with diseased udders. That the contagion was carried in the milk seems to have been fairly well established, from the fact that the epidemic was arrested by boiling the milk. That the primary origin of the disease germ was in the cow's udder, however, I think is open to question.

Carter[2] lays a certain amount of emphasis on the atmospheric conditions as an active cause of the disease, specifying low temperature, humid amosphere, lake winds, and an excess of ozone. This view is entertained by many others, and I think is embraced in the not infrequent suggestion that exposure to cold may give rise to croupous tonsillitis. As before stated, I regard croupous tonsillitis as a specific disease, and that it therefore cannot be the direct result of an exposure to cold. The same assertion is not infrequently made in regard to other affections, such as pneumonia, croupous laryngitis, or even diphtheria. As the result of an exposure, an acute catarrhal inflammation is set up in some portion of the air passages. A mucous membrane in a state of acute inflammation presents a much more favorable site for the arrest and lodgment of a croup germ or diphtheria germ than a healthy membrane. In other words, a disease germ, lodging upon a healthy membrane, is probably swept away and passes into the stomach with the first drink of water or bolus of food that is taken; whereas, if the membrane is in a state of inflammation, it lodges upon the morbid surface, and adheres to it until it has set up its specific form of inflammation. Taking cold, therefore, and its resultant inflammatory process must be regarded as an active predisposing cause of the disease, and nothing more.

In the same way, I think that an exceedingly important predisposing factor lies in a diseased condition of the tonsils. An hypertrophied tonsil, with its ragged and spongy surface, presenting the open orifices of its many crypts, will afford easy lodgment for the disease germ; whereas a healthy throat, in which the tonsil is not enlarged or diseased, would afford no lodgment for the infectious matter. This I have seen verified in many instances, in which an epidemic, or endemic running through a family, attacks those children with large, ragged tonsils, and passes over children with healthy air passages.

We thus take the view that physical conditions have a marked influence on the predisposition to the affection; or, in other words,

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Edinburgh Med. Jour., 1888–89, vol. xxxiv., p. 267.

[2] Chicago Med. Jour. and Exam., 1885, vol. ii., p. 514.

that the lodgment of the disease germ is to an extent mechanical, and influenced by local conditions.

It is usually considered as essentially a disease of childhood. This is undoubtedly true to a very great extent, and yet I think the true explanation of it is, not that children are more liable to it, as children, but that the physical conditions of the fauces which actively predispose to the disease are met with in child life more than any other period, viz., an hypertrophied state of the tonsils. These, as we know, develop usually at from three to five years of age, and at the time of puberty undergo atrophy. In addition to this, children are far more liable to attacks of catarrhal inflammation about the upper air passages, which also act as a predisposing cause of croupous inflammation. I think we must also accept the fact that the resisting power of a child being less than that of an adult, he becomes an easier victim to the invasion of a disease germ. What other factors are active in this direction can only be a source of speculation. Modern science teaches us that we live in an atmosphere laden with myriads of bacteria, which are constantly being taken into the system. In the one instance they become the source of diseased processes; in the thousands of instances they are destroyed or rendered inert by the fluids of the body. We find, therefore, that the problem reduces itself to a question of the powers of resistance of the body, and the activity of the germ. The child succumbs to the ravages of the bacteria, while the strong man resists their power. This, I think, is as far as we are able to go in giving a reason why a croupous inflammation is more frequently met with among children.

Sex naturally exerts no influence on a predisposition to the disease.

The question of the contagion of croupous tonsillitis is one which has received no little attention, and has been the subject of somewhat active discussion. It is by no means a difficult matter to establish the apparent fact that where the disease runs through a family, or runs through a neighborhood, one child has contracted it from another. These observations, as a rule, are deceptive. The disease usually manifests itself as an epidemic, occurring in the fall and spring months, when colds are prevalent and exposures frequent. It is far more liable, however, to run through a single family or a restricted locality than to spread through a large community. I know of no instance where it seems to have prevailed as an epidemic. The largest prevalence which has been observed has been in institutions where a number of children are aggregated, such as in schools or asylums. In most instances where this has occurred the source has been traced to defective

house sewerage. Where it prevails in a community, this source is traced to unsanitary conditions involving the whole of the district affected. That it is mildly contagious is probably true, and yet instances where a case can be directly traced to contagion are exceedingly rare. Boucsein[1] reports, somewhat in detail, three instances in which its contagiousness was apparently established. One of these was by prolonged kissing. He states further that he has seen six others. Somewhat similar observations have been made by Haig-Brown[2] and Froelich.[3] While, therefore, there is a possibility of contagion by absolute contact, I do not believe that, further than this, the disease is to be regarded as of a contagious character.

We have already stated that the lodgment of the germ in the fauces is largely influenced by local conditions, such as enlarged tonsils, etc. I think that we must recognize still further the fact that the general condition of the individual has a certain amount of influence in predisposing to an attack, on the ground that a weak and puny child offers less resistance to the development of a diseased process than one in robust health.

I have not infrequently observed attacks of croupous tonsillitis in the mother or attendant of a child sick with diphtheria. This, I think, is not to be attributed to any direct connection between the two diseases, but rather to the fact that the loss of sleep and mental anxiety have so far impaired the physical powers as to produce a predisposition to the disease. That there is a certain indirect connection between the diseases I firmly believe. This, however, will be discussed in another place.

PATHOLOGY.—The essential morbid lesion which characterizes this disease consists of a croupous inflammation involving the lining of the crypts of the tonsil. These are to a certain extent distended by this deposit, which makes its appearance in rounded, pearly white disks at their mouths. In connection with the croupous inflammation, there is usually a considerable amount of catarrhal inflammation involving the whole mass of the tonsil and extending somewhat to the mucous membrane of the faucial pillars and surrounding parts.

I know of no reason why this exudation confines itself so entirely to the tonsillar crypts, unless it be due to the fact that it is usually of a soft and friable character, easily broken down, and that hence, where it appears on the surface of the tonsil, between the mouths of its crypts, it is swept away in the act of deglutition.

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[1] Amer. Jour. of Med. Sciences, 1889, vol. xcviii., p. 348.

[2] Med. News, Philadelphia, 1887, Jan. 8th, p. 44.

[3] Deutsch. med. Zeit., 1887, vol. viii.

The reason of the primary deposit in these crypts, I take it, is that the germs which are the source of the disease find sufficiently firm lodgment in these depressions on the face of the tonsil to enable them to reproduce themselves, and thus set up this specific form of inflammatory action.

The simple catarrhal inflammation in which the tonsil is involved in this disease differs in no essential respect from that found in similar conditions in other portions of the upper air tract.

A microscopic examination of the exudation reveals simply a large number of fine fibrinous fibrillæ, crossed and interlaced in every direction, which embrace within their meshes leucocytes and epithelial cells. In addition to this, there is also found a certain amount of extraneous matter, which does not in any degree belong to the croupous inflammation, but whose presence is entirely adventitious. This is composed of fatty matter, scattered blood corpuscles, leptothrix, and various forms of bacteria such as are usually met with in the oral cavity, even in health. The essential fact, of course, as obtained by an examination of this material, is the establishment of the existence of an acute inflammatory process attended with the exudation of fibrin, thus establishing the existence of croupous inflammation.

The search for a specific germ in this form of tonsillitis has been made by a number of investigators. Fränkel,[1] in his investigation, discovered the existence of the Staphylococcus pyogenes aureus and albus; while Gabbi[2] has found the encapsulated bacillus of pneumonia. The staphylococcus indicates nothing further than the existence of a suppurative process. The presence of the pneumococcus is interesting as suggesting a possible relation between this disease and croupous pneumonia, and yet Netter[3] and Cornil[4] have found this germ in the tonsils in cases of pneumonia and meningitis.

This membrane, which is deposited about the orifices of the lacunæ, makes its appearance somewhat suddenly and persists from three to five days, and even longer, acting in much the same way as a similar process elsewhere, reproducing itself, after removal, with quite the same activity as in the primary deposit. As a rule, it is a soft and friable exudation, breaking down easily, in which case it confines itself to the small circle immediately about the mouth of the crypt. In other instances it seems to be of a denser, more efflorescent character, and in this case its area of deposit is larger, spreading to the tissue between the lacunæ, forming a well-developed false membrane (see Figs. 21 and 22).

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[1] Loc. cit.

[2] Loc. cit.

[3] Arch. gén. de Méd., 1887, vol. i.

[4] Cited by Netter, loc. cit., p. 450.

I take it that there is no difference between the follicular disease and what formerly was called croupous tonsillitis, except in the degree of the inflammatory activity. Loving[1] makes the statement that if the exudate be removed at the end of thirty-six hours, it is not reproduced; and furthermore that a membrane never reforms unless it exfoliates spontaneously. This is not my own experience, and I am disposed to think that the membrane re-forms as long as the peculiar blood condition exists which determines this variety of inflammatory action.

The original exudation, I think, confines itself somewhat closely to the orifices of the crypt, without extending very deeply into its cavity. Moreover, commencing as a croupous inflammation, it

FIG. 21.—Face of the Tonsil showing Extensions of Fibrinous Exudation from the Crypts over the surface.

FIG. 22.—Section of Same.

maintains its specific character during the whole continuance of the morbid process.

Occasionally we find a suppurative process developing. This is due entirely, I think, to the fact that the follicle becomes occluded, and an independent and suppurative action naturally ensues. This, however, is purely adventitious and bears no special relation to the croupous process.

The disease being of an acute infectious character, we should naturally expect that the cervical glands would be involved, and, while this does not occur in every case, it is probably the rule that they are abnormally sensitive and in many cases enlarged. Carter[2] has observed a case in which these glands underwent suppuration. The disease usually involves both tonsils simultaneously, and this is always true if the attack is a well-marked one. If the attack is mild, we may find it confining itself to a few of the follicles simply of one tonsil.

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[1] Columbus Med. Jour., 1889–90. vol. viii., p. 49. [2] Loc. cit.

It is not essentially a disease of the tonsils, because we oftentimes find it extending to the lymphatic tissues of the pharyngeal vault; and indeed I am disposed to think that it commences there far more frequently than we generally suppose, and is overlooked from the fact of the parts not being open to direct inspection. The lymphatic tissue also of the oro-pharynx, especially that within the lateral pharyngeal folds, is occasionally involved.

SYMPTOMATOLOGY.—While the attack is not usually ushered in by a fully developed chill, its onset is marked by very decided chilly sensations. This is immediately followed by a general febrile movement, characterized by headache, loss of appetite, pain in the bones, and general malaise. Pain in the back more severe than is usually characteristic of febrile disturbance, also is a somewhat prominent symptom. This is soon followed by a feeling of uneasiness and dryness in the fauces, but the active eruption of the follicular disease is usually postponed from twelve to twenty-four hours after the onset of the systemic disturbance. When this appears, the local symptoms in the throat assume a considerable degree of prominence, pain being the pronounced feature. While this is not constant in all cases, there is a persistent sense of fulness and discomfort about the fauces, together with a sharp, lancinating pain with every effort at deglutition. This cannot be accounted for by the extent of the swelling of the tonsil itself, as this is usually not great, but it is probably due to the fact that the terminal filaments of the nerves about the follicles are rendered abnormally sensitive by the deposit, and this sensitiveness becomes somewhat distressing in the act of deglutition, on account of the pressure upon them.

The general febrile disturbance, at the onset of the disease, is marked by a temperature running from 102° to 104°, and in young children is apt to be even greater; indeed, in very young subjects all the general symptoms are much more prominent, while, of course, on account of their tender age, the local symptoms are not so easily recognized. So great is this febrile disturbance in young patients that the commencement of the attack may even be marked by the occurrence of convulsive movements or well-marked eclampsia, the temperature running as high as 105° or 106°. In adult life, on the other hand, the temperature is usually from 100° to 102°.

The disease is essentially of a sthenic type, and in connection with the febrile movement we find the pulse full, bounding, and running from 100 to 120, according to the age of the patient.

These general symptoms continue for from twenty-four to forty-eight hours, when, as a rule, the febrile movement subsides to a

notable extent, and the disease, running its course in from five to seven days, the latter period is characterized by a somewhat moderate extent of fever. The painful local symptoms, however, as a rule, continue, unless ameliorated by treatment, until the disease undergoes resolution. This is in the natural course of an ordinary attack. Occasionally we find a relapse occurring on the fourth or fifth day, in which all the symptoms recur, or, if the attack has originally confined itself to one tonsil, the subsequent development of the disease in the opposite tonsil is attended by an exacerbation of all the symptoms.

The occurrence of albuminuria is often regarded as diagnostic evidence of the diphtheritic character of the disease. I believe it to be entirely distinct from diphtheria, and yet albumin is not infrequently found in the urine during the course of the attack, coming on usually early and disappearing with the defervescence.

We have already taken the ground that the same germ which excites the local inflammation of the tonsil, either directly or by its ptomaines, makes its way into the circulation. Cannonberg[1] makes the observation, on excellent ground, I think, that the occurrence of albuminuria in acute infectious diseases is the result of the elimination of the offending germs by the kidneys, or is attendant upon their passage through the renal tubules. In this connection Laure's[2] observation is of interest, he having found large numbers of bacteria in the albuminous urine of acute tonsillitis.

Friedrichs[3] was the first to observe the existence of enlarged spleen in this affection. Seifert[4] goes so far as to state that this is the rule. This is an interesting point, and furnishes still further evidence of the infectious character of the disease.

DIAGNOSIS.—An examination of the fauces, in ordinary cases, is quite sufficient to establish the diagnosis beyond much question. Of course the interesting point in this connection always is as to the possibility of the case being diphtheritic in character, and that this differential diagnosis can be established between the diseases with a very great degree of positiveness, I am fully convinced. The inspection should be made with a certain degree of care, and always with the parts fully at rest and thoroughly illuminated. Hence, in making the examination I think the concave reflecting mirror should be used in all cases, certainly where there is any possibility of doubt as to the true character of the exudation. When brought under inspection, the tonsil is found red and swol-

[1] Zeit. für klin. Med., 1880.

[2] L'Union Méd., 1882, 3d series, vol. xxxiv., pp. 637 and 651.

[3] Sammlung klin. Vorträge (Med.), No. 75.

[4] Wien. med. Woch., 1886, vol. xxxvi., p. 1,333.

len, and presenting the ordinary evidence of acute catarrhal inflammation, while at the same time, at the mouths of the crypts of the tonsil, there will be found presenting small rounded spots or disks of a clear, bluish-white or pearly white color, smooth, and closely adherent to the mucous membrane beneath (see Fig. 23). These spots vary in size from a large pinhead to perhaps the size of a split pea. If, now, we take a small probe, with a thin pellet of cotton upon it, and attempt to remove the exudation, this will ordinarily be found easy of accomplishment, provided the membrane extends beyond the orifice of the crypt. In this case it is found soft, friable, and easily detached from the parts beneath, coming away in small fragments or granules, as it were. If the exudation simply fills and distends the orifice of the crypt, it cannot be removed without injury to the parts.

Now, when we come to the question of diagnosis between this and diphtheria, I think there are certain features of the two affec-

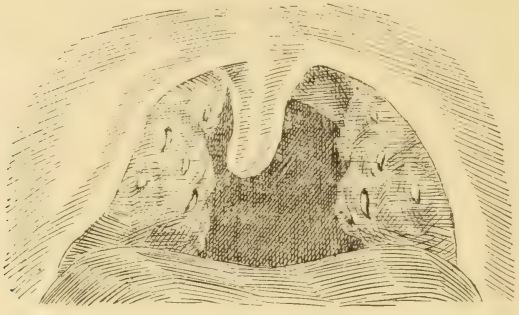

Fig. 23.—Acute Follicular Tonsillitis.

tions which are so distinctive as to render a diagnosis in most cases positive. Diphtheritic exudation, as we know, not infrequently is seen in its early stages commencing at the orifices of the crypts of the tonsils. The graver form of disease presents a thicker, more efflorescent membrane, standing out prominently upon the mucous membrane. It is of a yellow color, and closely adherent to the parts beneath. Moreover, the underlying mucous membrane is of a somewhat bluish or turgid hue, in contra-distinction to the bright arterial red of the mucous membrane which underlies the croupous exudation. Furthermore, a croupous exudation is easily detached from the parts beneath without injury to them, and without causing hemorrhage; a diphtheritic membrane cannot be detached without the rupture of blood-vessels. A croupous membrane is thin and not observably raised above the surface; a diphtheritic membrane is prominent. As the disease develops,

we have at the end of twenty-four to thirty-six hours the evidences of local necrosis, in the yellowish-black tinge which the diphtheritic membrane takes on and the sanious discharge which pours from beneath it. It is a dead tissue, with all the appearances of localized necrosis about it. The croup membrane, on the other hand, is a living membrane, and remains so until the end; a clean, white, healthy-looking membrane, which never presents evidences of any necrotic process.

Beebe has reported three exceedingly interesting cases occurring in the same family. Two of these were ordinary follicular tonsillitis; in his third case he makes the same diagnosis, but describes the membrane as having become fetid and gangrenous, although the patient was well on the third day. If the observation is correct, I think this is quite sufficient to establish a diagnosis of diphtheria--one of those mild, self-limited cases which get well without treatment. The case is interesting as illustrating the connection between the two diseases. That they are closely related in their origin I fully believe; and furthermore, that the dividing line between croup and diphtheria occasionally is an exceedingly difficult one to draw. This, however, fortunately, is very rare, from a clinical point of view; and while the germ that produces the two diseases probably springs from the same stem, after it lodges in the fauces it sets up distinct morbid processes, which from their onset run different clinical courses.

In establishing a diagnosis between the two diseases, I think the point of greatest importance and one always to be depended upon, certainly in my own experience, is that the croup membrane is easily detached from the parts beneath, while the diphtheritic membrane can only be detached by tearing it away, thus rupturing blood-vessels. Second in importance as a diagnostic sign I should place the gross appearances of the membrane. In the one case there is a clean, white, living exudation; in the other case, an exudation which, extending down into the meshes of the mucous membrane, shuts off the circulation, destroys its vitality, and produces local necrosis, this necrosis showing itself by the characteristic sign of fetor, sanious discharge, and the yellowish-black, dead-looking membrane which results. Besides this, we have additional evidence in the general disturbance and high febrile movement in croupous tonsillitis as contrasted with the asthenic type of the diphtheritic affection.

Reference has already been made to the existence of albuminuria, which, as we have seen, is not to be regarded as diagnostic of a diphtheritic process.

[1] North American Journal of Homœopathy, 1889, 3d series, vol. iv., p. 368.

PROGNOSIS.—The disease runs its course in from four days to a week, and, while involving no special danger to life, or grave tendencies, it is a period of much discomfort and even suffering to the patient while the attack persists. The severest pain is experienced during the first twenty-four to forty-eight hours. After this the fever subsides and the local pain is much ameliorated, except in aggravated cases. There are certain complications, however, which, while adding perhaps no danger to the disease, increase the discomfort of the sufferer. Prominent among these is the occurrence of a suppurative tonsillitis or quinsy. This is an especial danger in those who have the quinsy or rheumatic habit. The mistake should not be made of supposing that a croupous tonsillitis may terminate in a peritonsillar abscess, for there is no direct connection between these two conditions. The local inflammatory process in the throat simply precipitates an attack of cellulitis in those who are subject to quinsy. The occurrence of small abscesses in the tonsil from the obstruction to the mouth of the crypts has already been referred to, and does not notably complicate matters or add in any great degree to the suffering of the patient.

Albuminuria, when it occurs, which, as before stated, is not infrequent, is not to be regarded as a grave complication, and yet I think this is a feature of the disease which should be watched with a certain degree of care. Boucsein[1] has reported an instance in which nephritis following an attack of croupous tonsillitis resulted in a fatal termination.

We do not regard cardiac disease as one of the complications which may follow an attack of croupous tonsillitis, and yet Hague-Brown[2] reports that in an examination of 345 cases of this affection he found that 8 had endocardial lesions ending in chronic valvular disease, 3 had pericarditis, 10 had mitral regurgitation which subsequently disappeared, while 8 had functional murmurs due to anæmia.

Joal[3] reports a series of cases which were complicated by attacks of ovaritis and orchitis coming on at the end of the disease. This he regarded, not as evidence of any physiological relation between the tonsils and these organs, but rather as establishing the infectious character of the malady.

Froelich[4] reports a case complicated by peritonitis. This, however, was probably a mere coincidence.

It is a somewhat prevalent impression that paralysis of the palate following a fibrinous exudation in the fauces establishes a diagnosis of diphtheria. While this sequela is undoubtedly a much

[1] Loc. cit.
[2] Loc. cit.
[3] Arch. gén. de Méd., 1886, 7th series, vol. xvii., pp. 513 and 678.
[4] Loc. cit.

more frequent complication of diphtheria than of croupous exudation, I think it cannot be questioned that it may follow the latter disease, especially when we find instances reported by so many competent observers. Thus Beall[1] has seen this complication occur in two patients aged seven and twenty-five respectively, and coming on two and three weeks after the subsidence of the follicular deposit. Jordan[2] reports a similar complication coming on seven weeks after the termination of an acute attack of tonsillitis in a child aged seven.

A similar interval elapsed in a case reported by Ogle[3] in a patient aged twenty-six, while Mayer[4] reports a somewhat similar case in a young girl.

In all these instances the lesion promptly disappeared under the administration of general tonics and strychnia.

In addition to the paralysis of the palate in several of the cases above alluded to, there was a notable muscular weakness in the lower extremities.

Coutts[5] reports a case in which this muscular weakness seemed to affect the whole body, constituting a condition almost of general paralysis; while Prévost[6] reports an instance in which the complicating paralysis was confined to one of the upper extremities.

De Luce[7] also reports two cases in women, aged respectively twenty-two and thirty-five, in which the paralysis was the result, without any question, of attacks of follicular tonsillitis, although the reporter seemed to think that this complication was due to the use of caustics. Curiously enough, in one of these the paralysis was confined to but one side of the palate, the original disease having affected the tonsil on that side.

This last observation would seem to lend some weight to the view, which I fully indorse, that a large element in the causation of these paralyses lies in the local inflammatory process, which, extending somewhat to the muscular tissues, produces a sodden condition, as it were, by which they easily become involved in a paresis. Unquestionably, however, the general blood poison is the active and efficient cause of the paralysis, the local condition simply acting as a predisposing factor. How the infection in the blood acts in this way can only be a matter of speculation. We regard the germ of diphtheria as by far the more virulently infec-

[1] St. Louis Med. and Surg. Jour., 1886, vol. i., p. 279.
[2] Med. and Surg. Reporter, Phila., 1880, vol. xlix., p. 650.
[3] Med. Times and Gaz., London, 1864, vol. ii., p. 593.
[4] Union Médicale, 1860, 2d series, vol. vii., p. 553.
[5] Brit. Med. Jour., 1888, vol. ii., p. 75.
[6] Paris Médicale, March 6th, 1886.
[7] Bull. de Thérap., Paris, 1864, vol. lxvi., p. 546.

tious; and therefore, as is very natural, faucial paralysis is very much more common following diphtheria than following a croupous exudation. Of course the paralysis must be regarded as largely of a myopathic nature; in other words, the muscular fibre itself is in such a condition that it does not respond to the nerve current. That the peripheral nerve filaments may be involved cannot be questioned.

Given, then, the local morbid condition of the muscular fibres and the general blood-poison, and paralysis is the result. This chain of events, while most common in diphtheria, is not confined to it: as we have shown, it occurs in a certain proportion of cases in croupous inflammation of the fauces, and, as an exceedingly rare complication, in other infectious diseases. A point of great interest in this connection is whether a croupous laryngitis or true croup ever develops as a complication of croupous tonsillitis. In my own opinion, there is no question that this may occur, although the danger is a somewhat remote one when we consider the very great frequency with which we meet with the disease in the tonsils and the exceeding great rarity with which it is followed by a deposit in the larynx.

It may be suggested that, if a laryngeal croup develop, we have had to deal with the diphtheritic deposit in the tonsils. This does not follow. I regard the disease in the larynx which so frequently and fatally complicates diphtheria as usually croupous in character; in other words, there is a question in my mind as to whether we have a diphtheritic membrane in the larynx in all cases; the fatal complication which destroys so many lives in diphtheria being, as I believe, the secondary development of a croupous exudation in the parts below. This matter, however, is more fully discussed in the chapter on diphtheria. The point I wish to make here is that the tonsillar disease under discussion may be followed in young children by a similar deposit in the larynx, and in young children only; this tendency to croupous inflammation in the larynx disappearing, as we know, with the increase of years. Furthermore, I think this tendency of a croupous tonsillitis to be followed by a laryngeal complication, is increased to a certain extent by the richness or extent of the tonsillar deposit: thus, in those rare instances in which the fibrinous exudation spreads over the surface of the tonsil, forming a continuous membrane, if occurring in young children we must recognize that a serious danger exists of the same membrane making its appearance in the larynx. This does not occur by continuity of tissue, but by a secondary and independent deposit in the parts below. On the other hand, where the deposit occurs in the small pearly spots, which confine them-

selves to the mouths of the crypts, and which show no tendency to spread, the danger of a laryngeal croup may be ignored. Carmichael[1] reports a somewhat interesting case of a child convalescing from an attack of follicular tonsillitis, in which a diphtheritic deposit made its appearance on the twelfth day. E. Wagner[2] reports a case in which, following a follicular tonsillitis, a diphtheritic membrane made its appearance on the upper surface of the soft palate. A croupous deposit in the larynx followed, and the patient died. A similar case is reported by Fränkel.[3]

I find it exceedingly difficult to place these cases under the category of croupous tonsillitis. Carmichael's case was undoubtedly a true instance of the disease under discussion, and suggests the question as to whether the one disease may terminate in the other. I have seen no case in my own experience which fully warrants this belief, and I think we must regard Carmichael's case as a curious coincidence. I know of no reason why a child convalescing from croupous tonsillitis may not have diptheria, and possibly be more subject to it than when in perfect health, but that the one disease should terminate in the other is not to be regarded as among the probabilities.

TREATMENT.—As before stated, the affection is self-limited, and as a rule disappears spontaneously at the end of about a week; but as we have seen, this is a period of considerable suffering and a certain amount of danger, both of which can be largely eliminated by a proper course of treatment.

If the bowels are constipated, as is the rule in most febrile diseases, a saline laxative should be administered. I know of no special reason for administering mercurials, although I am disposed to believe that they exercise a certain amount of specific controlling influence on the development of a fibrinous exudation. This indication, however, is not prominent in croupous tonsillitis. If the febrile movement is high, this is best controlled by the administration of antipyrine, giving five-grain doses to an adult every half-hour until five doses have been administered. For a child, the dose is proportionately smaller. In this way not only is the temperature reduced, but the headache, which is oftentimes of a somewhat distressing character at the onset of the disease, is markedly relieved. If the fever or headache recur, the same drug may be again administered and in the same manner after an interval of three or four hours. In this way the prominent general symptoms will be notably relieved in the first twenty-four hours.

If the symptoms recur after this treatment, it is exceedingly

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[1] Edinburgh Med. Jour., 1884–85, vol. xxx., pp. 33 to 41.

[2] Jahrbuch für Kinderheilk., vol. xxiii., p. 402. [3] Loc. cit.

rare that they possess anything like the intensity which characterized the onset of the attack.

It may be necessary to repeat this treatment on the second day, but as a rule this will not be required. We then simply put the patient on the use of quinine in three-grain doses for an adult, given three times daily, until the attack is completely controlled.

The above measures are only indicated for the general condition. For the amelioration of the local symptoms it has been the practice to use nitrate of silver or some of the milder astringents applied locally by means of an atomizer or brush. I have not for many years now resorted to these measures, believing that we far more successfully combat the spread of the exudation, control the local inflammatory process, and relieve pain, by the use of iron; and for this purpose I know of nothing better than the officinal tincture, notwithstanding the assertion of Garland,[1] who attests to the uselessness of iron in this disease. It is to be administered as follows:

℞ Tinct. ferri chloridi, ... ʒ ij.
Glycerini, ... ad ℥ ij.
M.

To adults this is to be given in doses of half a teaspoonful every hour, and to a child in proportion. The mixture is not a disagreeable one to take, and the glycerin gives a consistency to it by which, when taken in the mouth and swallowed, it diffuses itself about the fauces, and in this manner acts as a local application. Of course the mixture is to be taken without dilution. I think that we not only get the local action of the iron here, but also the systemic effect by which the special blood condition is controlled.

I do not intend to say that we should never resort to local treatment in these cases, because undoubtedly we can accomplish much in the way of destroying the exudation by topical applications; and for this purpose either the officinal tincture or a solution of the perchloride or persulphate of iron may be used. The parts being brought under inspection, a pledget of cotton, wrapped on a slender probe and dipped into the solution, is applied to the croupous deposits, whereby the exudation is thoroughly saturated and thus removed. While the destruction of the membrane is thus accomplished, I believe the relief of pain is best obtained by the iron and glycerin mixture, and in many years' experience I have rarely seen instances in which this relief was not given in a comparatively few hours. Even after the attack subsides and the local conditions in the throat clear up, the patient is liable to be left in a condition

[1] Boston Med. and Surg. Jour., 1884, vol. cx., p. 103.

which requires a certain amount of building up. For this purpose I think after the first week it is best to administer some general tonic containing barks and iron with the addition of strychnia, for perhaps a fortnight longer. The addition of this latter drug undoubtedly has an influence in preventing the development of muscular paresis, although, as we have seen, this is an exceedingly rare complication. Should, however, this occur, the only further indication is for the increased administration of strychnia, experience having shown that this paralysis yields more readily to this drug in connection with general tonics than to the use of electricity.

Pepper[1] prefers to administer the iron in connection with chlorate of potash, while Seifert[2] administers the potash salt alone. The usefulness of this drug is greatly overestimated. It makes an excellent cleansing wash in chronic catarrhal diseases, but I doubt if it has any effect on acute processes, of either a catarrhal or exudative character.

Lebrun[3] uses a local application of iodoform and collodion for disinfecting purposes, while Haberkorn[4] accomplishes the same end by means of salicylic acid.

I am disposed to think that the indications here are for the destruction of the membrane rather than for disinfecting it.

Gouggenheim[5] gives 60 grains of salol daily in divided doses, a form of treatment indorsed by Wright.[6] This drug undoubtedly possesses a certain potency in the treatment of quinsy, but I cannot understand how it should have any notable effect upon a croupous exudation, other than controlling febrile movement. Allusion has already been made to the development of a quinsy in connection with follicular tonsillitis, and the danger of a suppurative inflammation being precipitated by an attack of the latter disease. This suggests to us the importance of recognizing this danger, and, where the quinsy habit is present, of commencing the administration of the salicylates somewhat early in the course of the treatment. As a rule, in such cases their administration should be commenced as early as the second day.

A number of observers attach a certain amount of importance to the administration of aconite. It is an old remedy which for many years has been used in connection with most of the acute inflammatory troubles of the fauces. It undoubtedly possesses a certain amount of efficacy, and yet, in view of the fact that we have

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[1] Phila. Med. Times, 1882–83, vol. xiii., p. 317. [2] Loc. cit.
[3] La Clinique, Brussels, Feb. 13th, 1887, pp. 22 to 24.
[4] Cent. für Chir., 1889, vol. xvi., p. 553.
[5] Revue gén. de Chir. et de Thérap., 1889, vol. iii., p. 543.
[6] American Journal of Med. Sciences, 1890, vol. c., p. 158.

other drugs whose action is so much more certain, prompt, and efficient, I think that cases are very rare in which its administration is indicated.

But one more question remains for discussion in this connection, and that is as to the necessity of isolating our cases. We have already taken the ground that the disease is epidemic and endemic, but practically not contagious. If, therefore, the diagnosis is thoroughly well established and beyond question, I see no reason for isolating a patient suffering from this disease. If, however, there be any question in the mind of an observer as regards the character of the exudation with which he has to deal, it of course is much safer that other children should not be exposed to a possible source of contagion.

We thus find that the treatment of this affection is a comparatively simple matter, and, moreover, attended with immediately successful results. We have discussed the whole subject, however, at considerable length because I believe that its true status should be thoroughly understood, its clinical features established, and especially its clinical significance recognized. The appearance of any form of exudation in the throat is always a source of great anxiety and alarm to a parent; hence it is important that we should be able to recognize with certainty what we have to deal with and be able to relieve the solicitude of a family by the assurance in any given case that the disease is not diphtheria, but a simple croupous or follicular tonsillitis.

CHAPTER XIII.

TONSILLITHS.

ANATOMICALLY, an enlarged tonsil presents conditions more favorable perhaps for the development of a calculus than any other region of the body. That they are not met with here, however, more frequently is probably due to the fact that the parts are subject to such constant motion and pressure, in the act of deglutition, that their formation is necessarily interfered with. In this region, as elsewhere, calcareous formation takes place around some foreign body acting as a nucleus. In the case of the tonsil, this is probably found in some particle of the cheesy matter which accumulates in the dilated crypts of the diseased organ. The frequent presence of these masses of cheesy matter would therefore seem to particularly favor the development of calcareous concretions.

Owing to the constant pressure to which the organs are subjected, this cheesy matter is thrown out at such frequent periods that it does not, as a rule, remain sufficiently long in the crypts to permit of calcareous deposits being formed. This will easily explain, therefore, the rarity of their occurrence.

Their presence cannot be easily overlooked, and we find cases reported by early writers, such as Lang,[1] Blegny,[2] Marcellus Donatus,[3] Schenck,[4] Riverius,[5] Nicholas Florentinus,[6] Hoffmann,[7] Bailheron, Bourguet, and Souque.[8]

The fondness for reporting curious diseases, such as stone in the throat, as these cases were generally termed by these writers, which characterized earlier medical literature, probably led to the recording of most of the instances of this affliction which occurred; hence the above reports are somewhat indicative of the frequency of the disease. In later years they excited somewhat less interest,

[1] "Sec. Epist. Med. Misc.," Basileæ, 1560, p. 233.
[2] "Zod. med. Gallic.," ann. iv. and v., fev. obs. 4, p. m. 30.
[3] "Hist. Mirab.," Venetiis, 1597, lib. sex, in 4, fo. 188.
[4] "Obs. Med. rar.," Francfort, 1609, p. 227.
[5] "Prac. of Physick," London, 1678, obs. 479, by Denis Pomaret.
[6] Cited by Frank, "Nat. Cur.," Norimbergæ, 1690, Dec. 2d, ann. vii., 328, obs. 141.
[7] "Eph. Nat. Cur.," 1717, cent. vi., obs. 68, p. 302.
[8] Cited by Louis, Mem. Acad. de Chir., 1774, vol. v., p. 461.

although we find observations on the subject by Wilson,[1] Laugier,[2] Guéneau de Mussy,[3] Larrey,[4] Knaus,[5] Terrillon,[6] Wyeth,[7] Smith,[8] Reid,[9] Lennox Browne,[10] Nixon,[11] and others.

But one of these cases has come under my own observation. In this instance the patient was a man aged twenty-eight, in whom I removed from the left tonsil an oval mass, 1⅛ inches long, ¾ of an inch wide, and ½ an inch thick. This was imbedded in the posterior portion of the left tonsil, and was easily removed by the index finger. The tonsil was notably enlarged, and the symptoms had been merely those due to the tonsillar hypertrophy.

Lennox Browne has seen but one case, while Mackenzie [12] reports having observed three.

ETIOLOGY.—According to Wagner,[13] chalky concretions result either from a catarrh of a mucous membrane, the presence of a foreign body, or a change in secretion. As before stated, I am disposed to regard a tonsillar calculus as due to the presence of a foreign body, although the existence of a catarrhal inflammation, with the increased blood supply, may undoubtedly have its influence. Browne,[14] quoting Gruening's [15] statement that tonsillar concretions are parasitic in origin, seems to advance the view that a tonsillar calculus is also of parasitic origin. Gruening merely makes the point that the leptothrix has much to do with the development of cheesy matter in the tonsil, but does not refer to the calcareous concretions, the formation of which I do not believe, in any degree, to be of parasitic origin. The cheesy matters, lying in the crypt of the tonsil, excite recurrent attacks of catarrhal inflammation in the organ. As the result of increased blood supply, the carbonates and phosphates of lime from the blood are deposited about the cheesy material, and this process, continuing for a long period of time, results in the development of the calculus.

Reid makes rather an interesting point in this connection, that

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[1] Cited by Monro: "The Morbid Anatomy of the Human Gullet, Stomach, and Intestines," Edinb., 1811; "Calculi of the Tonsils," p. 74.

[2] "Note sur un Concrétion des Amygdales," in Journ. de Chemie méd., 1826, vol. ii., p. 105.

[3] "Traité de l'Angine tonsillaire," Paris, 1857, p. 189.

[4] Bull. de la Soc. de Chir., 1866, 2d ser., vol. vii., p. 65.

[5] Cited by Boden Miller, Würtemb. Corr. Blatt., vol. viii., p. 315.

[6] Arch. générales de Méd., Paris, 1886, 7th ser., vol. xviii., p. 144.

[7] Med. Record, New York, 1881, vol. xx., p. 523.

[8] Ibid.

[9] Australasian Med. Gaz., 1885, vol. v., p. 9.

[10] "Throat and Nose and their Diseases," London, 1890, p. 258.

[11] Trans. Acad. Med. of Ireland, 1885, vol. iii., p. 289.

[12] "Diseases of the Throat and Nose," Phila., 1880, vol. i., p. 88.

[13] "Man. of General Pathology," Amer. edit., N. Y., 1883, p. 320.

[14] Loc. cit.

[15] Arch. of Laryng., vol. iii., p. 136.

an increased blood supply, followed by an interrupted blood current, may have an important influence in developing a tonsillar calculus, basing his view on the experiments of Litten, who produced artificial calcification of tissue, by arresting the blood supply to the part, and then allowing it to go on, repeating this process a number of times.

Robin[1] finds a possible source of the calculi in minute calcareous crystals, which the microscope shows to exist in the tonsillar glands. Schenck[2] thinks they may be due to a gouty diathesis. No reports, so far as I know, however, have ever demonstrated the presence of urates.

PATHOLOGY.—These calculi consist mainly of the phosphate and carbonate of lime, in somewhat varying proportions, together with a small quantity of carbonate of magnesia, water, albumin, and some organic elements. A foreign body is recognized as the nucleus.

An analysis made by Laugier is as follows:

Water, ...	25%.
Phosphate of lime, ...	50%.
Carbonate of lime, ...	12½%.
Mucus, ...	12½%.

The calculus has its origin in the crypt of the tonsil, which becomes enormously dilated to accommodate the increasing proportions of the deposit. The case which occurred in my own practice was probably an unusually large one, Reid's was nearly as large, while Lennox Browne's measured an inch in its longest diameter. In most of the cases the concretions are reported as of the size of a nut or an olive pit, and in some even smaller.

As a rule, they occur singly, although in Bourguet's case there seem to have been quite a large number of small calculi.

SYMPTOMATOLOGY.—Their presence gives rise to no prominent symptoms, other than those of an ordinary case of enlarged tonsils. There are repeated attacks of sore throat, with perhaps a sense of irritation in the fauces, which is more marked than is usually the case in simple hypertrophy. In most instances their presence is entirely unsuspected on the part of the patient, the symptoms being accounted for by the existence of the enlarged tonsil. The recurrent attacks of inflammation are usually of a catarrhal nature, although a number of instances have been reported in which suppuration has occurred about the concretion. This seems to have been merely an aggravation of the inflammation as the result of the presence of a foreign body, and not a fully developed quinsy.

[1] "Traité des Humeurs," 2d edit., 1874, p. 551. [2] Loc. cit.

During the intervals of the exacerbations the presence of the stone seems to give rise to no especial annoyance; in other words, I find no recorded case of chronic ulceration or suppurative process resulting from its presence, with the exception perhaps of Mackenzie's cases, which, however are not quoted in detail.

Cough seems to have been a persistent symptom in some of the cases, due apparently to the presence of the calculus, although this might ordinarily be explained by the existence of the enlarged tonsils.

Difficulty in swallowing is a symptom which is prominent, according to the size and location of the concretion.

In Knaus' and also one of Bailheron's cases, distressing dyspnœa was present. This was due to an acute inflammation of the tissues surrounding the mass.

DIAGNOSIS.—A tonsillar calculus is of whitish-gray color, dense in consistency, and, in a large proportion of instances, projects from the gland in such a way as to be easily recognized on the first inspection of the fauces. In other instances it is completely imbedded in the tissues in such a way that the tonsil presents no appearance whatever which would suggest the existence of a chalky concretion; indeed, it has occasionally happened that the first knowledge of a calculus has been obtained in attempting the excision of the hypertrophied gland, the knife or guillotine being arrested by the hard mass in such a way as to leave the operator in a somewhat awkward predicament.

If a calculus is imbedded in the tonsil and not recognized by ocular inspection, its presence is of course easily determined by palpation with the finger or an exploration of the crypt by means of a bent probe. In view of the accident just referred to, it is well, I think, in all cases to thoroughly investigate the organ as above before attempting tonsillotomy.

PROGNOSIS.—Chalky concretions in the tonsil probably possess no tendency whatever to spontaneous absorption or disappearance. Occasionally they become loosened in the act of coughing, and are expelled spontaneously.

Their presence gives rise to no serious symptoms, and involves no special danger.

Of course it is among the possibilities that one of these concretions should become detached and drop into the air passages below, although I know of no such accident having been reported.

TREATMENT.—The only indication for treatment which they present is in their removal. This is ordinarily accomplished with ease. If the mass is in sight, it can be seized with a stout pair of forceps, and drawn from its bed. If the orifice of the crypt in

which it is formed is smaller than the bulk of the mass, it is an exceedingly simple procedure to enlarge it by means of a bistoury.

Reid found it necessary to crush the stone in his case, although why this procedure was demanded it is difficult to understand.

In my own case the mass was easily enucleated by means of the index finger inserted in the fauces. In Nixon's case the stone was removed by means of the finger and a scoop. Its removal was followed by considerable hemorrhage, although this is not a complication usually to be anticipated. In a number of the cases reported, the stone was removed during an attack of acute inflammation, which immediately subsided upon the removal of the calculus. The existence of an acute exacerbation does not therefore contra-indicate operative interference.

After the mass has been extirpated, the further indications for treatment are the removal of the hypertrophied tonsil. This, I think, should in all cases be delayed until any acute inflammatory action, which may have been present, has disappeared.

CHAPTER XIV.

MYCOSIS OF THE FAUCES.

THIS term is used as including those cases which are not infrequently met with in practice and which in literature are described as mycosis tonsillaris, mycosis pharyngeus, etc., according to that portion of the fauces wherein the disease either has its primary origin or most prolific development. The term "mycosis" is derived from the Greek word "mykes," meaning fungus, and hence is used as describing a faucial disorder which consists essentially of the development of a fungous growth in this region.

It consists of a deposit upon the surface of the mucous membrane or within the crypts of its follicles, of the spores of mycosis leptothrix, which develop by a natural process of growth, forming vigorous plants, whose offshoots project noticeably above the surface of the membrane, while at the same time, by a more or less rapid progress, the area from which they spring broadens until neighboring parts are involved.

ETIOLOGY.—The immediate cause of the attack is the deposit of the specific spore upon some part of the mucous membrane. Its primary source, however, is somewhat problematical. It may be carried in and deposited in the fauces by the ingoing current of air, although it is altogether more probable that its direct source is in the oral secretions.

Toeplitz,[1] indeed, in his investigations, has isolated three different varieties of the leptothrix from the secretions in the mouth. The clinical status of the leptothrix is very clearly stated by Wagner[2] as follows: "In every one it occurs upon the finely granular masses of decomposition within the teeth (summit of the papillæ of the tongue, sediments around the teeth, tartar), in great masses in the thick brown coating on the tongue (typhus), constant in the intestines and in the fæces, very frequent in the vagina, sometimes in the lachrymal duct." Finding it thus commonly developed in the anterior parts of the oral cavity, it is not difficult to understand how its development might be transferred to the mucous membrane of the fauces. The mouth, therefore, is probably the

[1] New York med. Presse, 1886–87, vol. iii., p. 13.

[2] "Manual of General Pathology," Amer. Ed., N. Y., 1883, p. 93.

immediate source of the spores which give rise to the fungus development in the faucial mucous membrane. Why this transfer should take place it is not easy to state.

Damaschino [1] regards impaired general health as a prominent predisposing factor in the causation of this migration from the oral cavity and development in the fauces. When we consider, however, how constant the leptothrix is in the mouth, and how exceedingly rare it is to meet with a case of mycosis of the fauces, this view would seem somewhat problematical. It should be borne in mind, however, that whereas this cryptogam is found in the oral secretions almost as a rule, it rarely develops to such an extent even in this region as to produce a pathological condition. Indeed, it is altogether probable that it could be found in the secretions of the fauces in a fairly large proportion of cases, if the examination were made with sufficient care. Hence, the real consideration as to etiology involves the question as to why it should take on such vigorous growth in either region as to constitute a pathological condition. To this question we have no answer to suggest. We simply recognize the fact that in a number of instances we find it taking on this exceedingly vigorous growth in the faucial mucous membrane, and thus presenting features which demand remedial interference. In one of Damaschino's cases the disease developed after an acute pharyngitis, while in three instances reported by Goris [2] the origin of the disease was attributed to the fact that the patients lived in a damp, somewhat unhealthy atmosphere. That an acute inflammation of the membrane may favor its development seems to be quite reasonable—a fact which we frequently notice in connection with other disease germs. Toeplitz [3] observed several cases following tonsillitis and diphtheria. In the cases which have come under my own observation the patients were apparently in the best of health with the exception perhaps of one case, that of a man of thirty in which the general health was somewhat impaired by overwork and nervous strain. I have met with but six cases in my own practice, two of which were males and four females, the youngest being sixteen, while the oldest was thirty-two. No age, however, seems exempt, in that Baginski [4] has reported a case occurring at the age of twelve, while Heryng [5] has seen one in which the disease developed at the age of sixty-two. Damaschino [6] makes the suggestion that an acid reaction

[1] Gaz. des Hôpitaux, Paris, 1880, vol. liii., p. 689.
[2] Revue de Laryng., 1889, vol. x., p. 275. [3] Loc. cit.
[4] Protocol der Berl. klin. Gesellsch., May 17th, 1876.
[5] Zeitschrift für klin. Med., 1884, vol. vii., p. 363.
[6] Loc. cit.

of the oral secretions favors the more vigorous development of the spores.

It usually occurs between twenty and thirty-five years of age. It would seem as if the disease was of somewhat recent origin when we consider that the first report of which we have any record is that made by B. Fraenkel[1] as late as 1873. That, however, it simply failed of recognition cannot be questioned when we consider the number of observations which have followed. Thus we find, in addition to those already quoted, contributions on the subject by Ubisch,[2] Klebs,[3] E. Fraenkel,[4] Gumbiner,[5] Gruening,[6] Bayer,[7] Cohen,[8] Semon,[9] Lloveras,[10] Boland,[11] Guinier,[12] Ferre,[13] Chiari,[14] Mendes-Bonito,[15] Lober,[16] Decker and Seifert,[17] Olmszewski,[18] Vanderpoel,[19] and Metzner.[20]

PATHOLOGY.—The leptothrix belongs to the schizomycetes group of fungi, this latter term applying to all those minute vegetable organisms which are almost ubiquitous in drains, refuse-heaps, running streams, bogs, etc. They also appear in urine, milk, or other watery solutions containing organic matter on remaining exposed to the air for any length of time. Indeed they embrace all those minute organisms devoid of chlorophyll, known as bacteria, microbes, etc., which are regarded as vegetable organisms and which multiply by repeated divisions. The name leptothrix is given simply to that species of the schizomycetes in which the cells assume an elongated cylindrical, or thread-like shape. When the spores of this plant lodge upon the mucous membrane of the fauces, these small thread-like bodies, augmenting rapidly by fission, multiply themselves, gradually building up the plant-like mass of spores which is easily recognized on gross inspection, standing

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[1] Berl. klin. Woch. 1873, p. 94 et idem, 1880, No. 18.
[2] Berl. klin. Woch., 1875, No. 52. [3] Arch. f. exper. Patholog., 1876.
[4] Zeitschr. f. klin. Med., Leyden, 1882, p. 288.
[5] "Ueber eine gutartige Mycosis der Pharynx," Inaug. Dis., Berlin, 1883.
[6] Arch. of Laryngol., 1882, vol. iii., p. 136.
[7] Revue mensuelle de Laryngol., 1883.
[8] Polyclinic, Phila., 1883–84, vol. i., p. 133.
[9] St. Thomas Hosp. Reports (1883), 1884, vol. xiii., p. 127.
[10] Revista Med. Quirurg., 1884, No. 15.
[11] Ann. de la Soc. méd. chir. de Liege, 1885, vol. xxiv., p. 597.
[12] Revue mens. de Laryngol., 1886, vol. vi., p. 181.
[13] Jour. de Méd. de Bordeaux, 1886–87, vol. xvi., pp. 589–591.
[14] Revue mensuelle de Lar., 1887, vol. vii., p. 559.
[15] "De la Pharyngo-Mycose," Bordeaux, 1887.
[16] Bull. méd. du Nord, Lille, 1888, vol. xxvii., pp. 170–173.
[17] Sitzungsb. d. phys.-med. Gesellsch. zu Würzb., 1888, pp. 26–28.
[18] Gaz. lek. Warsaw, 1888, 2 s., vol. viii. pp. 83–85.
[19] New York Med. Journal, 1889, vol. xlix. p. 147.
[20] Berl. klin. Woch., 1889, vol. xxvi., p. 653.

out from the surface of the mucous membrane as small pointed, wartlike projections of a clear milk-white chalky color.

When subjected to microscopic examination, it will be found that these masses are made up of a number of fully developed rod-like cells of leptothrix imbedded in a mass of amorphous granules. Heryng[1] has closely studied the pathological changes which the growth presents in the fauces, and I have not hesitated to avail myself of this elaborate investigation.

If treated with a weak Lugol's solution we find that the thread-like bodies assume a distinct bluish tinge, demonstrating the presence of starch. The granular elements take on a much lighter blue color. We, moreover, find that these thread-like or rod-like bodies stain unequally, the alternation of the stained and unstained portions giving an appearance as if the thread were broken up into joints or segments. This segmentation is apparent rather than real. It is usual to find in the masses removed not only the leptothrix itself, but also a certain number of flat pavement epithelial cells from the site of removal. These cells vary in shape according to the particular anatomical region from which the specimen has been removed. Pressure on the cover glass frequently breaks up the long thread-like bodies into shorter rods, but we are never able in this manner to disintegrate them so that they resemble the granular bodies before described, which appear to be as distinctive a form of the growth as the long thread-like portions. When the cryptogam grows upon the surface, it is either located superficially or may penetrate, in a sort of a wedge-shaped manner, deeper toward the parenchyma of the tissue. In the first case the mass is simply attached directly to the flattened epithelial cells, and presents in the centre a homogeneous striated appearance, while toward the periphery the mass is branching and more broken up. In the second case, where the growth penetrates deeply into the tonsil the epithelial cells lose their characteristic form and are partially or completely destroyed. In this event the growth is of a more granular and denser appearance, and staining with iodine fails to bring out the rod-like bodies. The probable cause for this is, as Heryng[2] suggests, that they become obliterated by the pressure.

When the disease penetrates into the crypts of the tonsil, the alterations in the organ appear to be confined almost entirely to the superficial epithelial layer, which is thickened, and the cells lose their characteristic form, probably from pressure, and become atrophic and ill defined. The crypts become dilated and filled with

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[1] Zeitschr. für klin. Med., 1884, vol. vii., p. 358. [2] Loc. cit.

the fungous growth and degenerated epithelial cells. In thin sections, staining with iodine reveals the characteristic thread-like bodies colored blue and also the amorphous masses. Goris[1] has been able to demonstrate the presence of muscular fibres in a mass of the vegetation removed from one of the faucial pillars, thus showing that tissues other than the lymphatic can be penetrated by this organism.

Although having no practical bearing on the development of the disease in the pharynx, it is interesting to record that Jacobson[2] has succeeded in cultivating on potatoes the spores of the leptothrix, taken from the pharynx.

SYMPTOMATOLOGY.—The presence of this growth in the faucial mucous membrane seems to be tolerated with almost entire impunity, in that it excites no inflammatory changes whatever in the membrane proper. The symptoms, therefore, which accompany its presence seem to be purely mechanical in character. At its first development, the patient is scarcely conscious of its presence. As the plant increases in its area of distribution, the movements of the fauces become hampered somewhat, their flexibility is lessened, and there is a feeling of stiffness in the region, especially during the act of deglutition, or in the other ordinary movements of the fauces. This is more marked, of course, in those instances in which the plant grows in the pharyngeal mucous membrane, where its presence not only gives rise to a feeling of stiffness in the parts, but also offers a moderate obstruction to the passage of the bolus of food. Occasionally there is a slightly irritating cough observed in connection with mycosis in the pharynx. This probably, however, in most instances, is due to an accompanying, rather than a resulting irritation or inflammation of the mucous membrane, either of the pharynx or parts below.

It usually occurs in individuals in the enjoyment of perfect health, nor does its invasion or presence seem to give rise to any general disturbance, either febrile or otherwise. Guinier[3] and Damaschino[4] seem to regard impaired general health as a somewhat active predisposing cause of the affection.

In the case which Cohen reports, the diagnosis of mycosis was based on the presence of some interlaced filaments, apparently resembling leptothrix, which were found in the false membrane in the fauces, in a girl sixteen years of age. The clinical history of the case reads strikingly like one of fibrinous exudation, both as regards the local morbid process and the systemic disturbance. The attack was also followed by paralysis of the pharynx. Cohen uses

[1] Loc. cit. [2] Wratsch, 1885, Nos. 27 and 29.
[3] Rev. mens. de Laryngol., etc., 1886, vol. vi., p. 181. [4] Loc. cit.

the term mycosis in reporting the case. The observation certainly is unique.

DIAGNOSIS.—When the plant has attained such proportions and area of distribution as to be recognizable on ocular inspection, it makes its presence known in such a way as to be almost unmistakable. It is usually found in its largest and most perfect development in the crypts of the tonsil, extending therefrom to the lateral walls of the pharynx, and to the glandular structures at the base of the tongue. Its starting-point most frequently is in the faucial tonsil. Next in frequency it has its origin at the base of the tongue in the lingual tonsil. Its occurrence or extension to the pharyngeal tonsil is somewhat rare, although it has been observed in this region by Siebenmann[1] and Schubert.[2] In both these cases it should be stated that the growth was aspergillus.

In Semon's case the growth made its appearance on the soft palate and uvula, and was easily detached without hemorrhage; while in Ubisch's[3] case it confined itself to the tongue, the whole dorsum of which was covered.

When seen, it presents in small, somewhat pointed masses or shoots, projecting from the surface of the mucous membrane, of an opaque, milky-white color, moist in appearance, and of soft consistency. Ordinarily there appear a number of straight plants projecting from the mucous membrane and scattered over the surface of the tonsil or such other region as may be affected, while in spots it presents aggregated masses, covering an area the size of a coffee-ground or larger, the surface of these small areas showing the vegetable character of the growth in the minute and somewhat acuminated projections that appear on their surface.

There are few diseases with which it may be confounded, although possibly it might be mistaken for the cheesy masses which are so frequently found in the crypts of the tonsil. These latter, however, present an ordinary yellowish and somewhat fatty aspect, in distinction to the clear, milky-white color of mycosis. Furthermore, the cheesy masses are easily pressed out of the tonsil, whereas the leptothrix can only be torn away with the rupture of blood-vessels. Both Gruening[4] and Chiari make the point that cheesy masses in the tonsil are composed of leptothrix. That the leptothrix spore is present cannot be questioned, but that it constitutes a mycosis, I think, we are compelled to deny, in that the leptothrix plant, in the disease under discussion, takes firm root and develops into a somewhat vigorous growth, spreading to neighboring tissues,

[1] Monatschrift f. Ohrenh., Berlin, 1889, vol. xxiii., pp. 73–76.
[2] Deutsches Arch. f. klin. Med., xxxvi.
[3] Berlin. klin. Woch., 1875, No. 52.
[4] Loc. cit.
[5] Loc. cit.

while the leptothrix in these cheesy masses of the tonsil is almost absolutely quiescent.

Acute follicular tonsillitis has something the appearance of mycosis, and yet the evidence of local inflammatory action, together with the marked febrile disturbance which accompanies it, renders a mistake in diagnosis unnecessary. It might be stated here, as bearing on Cohen's case above referred to, that the leptothrix spores are usually found in the exudation of acute follicular tonsillitis.

The disease generally starts on one side, but after persisting for some time it usually develops on the opposite side of the fauces. I have never seen a case in which there seemed to be any suggestion of symmetry of development, the more extensive growth on one side or the other always evidencing the fact of a longer duration of the disease.

Schech[1] seems to think that mycosis might easily be confounded with diphtheria. This view, however, I should scarcely regard as well taken, in that both the local appearances and the general systemic disturbance in diphtheria are so characteristic as to render such a mistake culpable, even in the early stages of either disease. Of course the microscope should in all cases render the diagnosis certain. It should be stated, however, that the mere presence of a few scattered spores of leptothrix should not be sufficient to establish a diagnosis of mycosis, but they must be not only present in sufficient numbers, but be grouped together in such a manner as to establish the fact of a somewhat vigorous growth.

PROGNOSIS.—Mycosis seems to be a very harmless disease, and one which involves no dangerous tendencies. The growth, however, is usually somewhat vigorous and has a tendency to spread by a slow, but very sure process of development. As to what influences either accelerate or curtail its progress, our clinical knowledge affords us no information. Apparently it continues to grow as long as the conditions persist which favor its development. Furthermore, it extends somewhat slowly, but surely, over those regions of the mucous membrane of the fauces where the plant finds a foothold. Apparently the most favorable site for it is in those portions of the mucous membrane where depressions and irregularities of surface exist, such as the faucial and lingual tonsils. Here it grows vigorously. On the smooth surface of the posterior pharynx and the walls of the cheek the local conditions do not exist which favor its development, and yet even here it finds a foothold. The growth here, however, is not very vigorous.

[1] "Diseases of the Mouth, Throat, and Nose," English ed., Edinburgh, 1886, p. 182.

Having established itself in a favorable locality, such as the tonsil, it remains. While, therefore, the regions in which it may grow are perhaps limited, there is no limit to its permanence. Apparently it may persist as long as life lasts.

TREATMENT.—While we have intimated that the disease is purely a local one, and one which gives rise to no general disturbance, this does not militate in any way against the view that there are certain systemic conditions which favor the development of mycosis. Certainly, when we consider the almost ubiquity of this germ, we are necessarily compelled to recognize some general condition which leads to its development in one individual, while so many others escape in whose oral secretions the leptothrix is undoubtedly present. The treatment, therefore, of the disease necessarily should be both local and general. Local measures consist of the eradication of the plant by such measures as may tend to destroy the germs. Semon's case, apparently, was cured by the local application of tannin and chlorate of potash. In this case, it should be remembered, however, that the plant developed on the soft palate and uvula, and hence was so loosely attached that it was removed easily without lacerating the tissues. These simple measures on a mycosis involving the tonsil would probably be absolutely futile. Guinier used nitrate of silver, tincture of iodine, and calomel insufflations, in connection with the use of forceps for removing the growth, together with constitutional treatment. The cure which resulted was probably due to the latter agents, rather than to the milder local applications. Chiari used the galvano-cautery in one of his cases, while in another he made local applications of a solution of bichloride of mercury (1 to 1,000), at the same time directing the patient to use a gargle of the drug (1 to 2,000). He reports good results in both instances; Goris used bichloride in a solution of 1 to 2,000 successfully, rubbing it well into the parts, after picking off the growth with the forceps. Damaschino reports a case cured by a borated lotion. Heryng made use of the galvano-cautery, first having excised the tonsils, with favorable results. This procedure of Heryng's seems to me exceedingly opportune. There can be no question that the most favorable local condition for the development of the leptothrix lies in the spongy mass which makes up the tonsil. Hence the removal of this tissue removes very largely the favoring locality for it to obtain a foothold. This, I think, should undoubtedly be done in all cases where feasible.

The local indications, then, consist in, as far as possbile, removing the tissue which favors its growth, while at the same time the plant itself is to be destroyed. Probably the galvano-cautery for

destructive purposes, in its convenience of manipulation and in its efficiency, affords us a device which presents advantages over all others, although undoubtedly equally thorough work may be done with the milder destructives, such as chromic acid or the solid stick of nitrate of silver. I see no special good to be accomplished by the removal of the growth alone by means of forceps, without destroying the part from which it springs. In the cases which came under my own observation, the sharp curette was used, scraping away, not only the mycotic growth, but also the mucous membrane. This was followed by cauterization with chromic acid. The results were entirely satisfactory. In addition to the local destruction, Chiari's plan of rubbing in sublimate solution will add to the probability of a successful result.

Conceding that there is a systemic condition favoring the development of these growths, it becomes our duty to correct any general dyscrasia or habit that may be discovered in the individual, carrying out indications as they present. Special attention, in this connection, of course, should be directed to the condition of the digestive apparatus, and any errors found here should be regulated. In addition to this, the only specific suggestion, it seems to me, that can be made is based on the observation of Damaschino, who goes so far as to state that the leptothrix germ only flourishes when the oral secretion presents an acid reaction. The suggestion here seems to be quite obvious, not only to make free use of alkaline lotions and gargles, but at the same time to administer them internally, so as to render the secretions alkaline, as far as seems wise. In Klebs' case, which seems to have been rather an obstinate one, a mycosis involving the base of the tongue and both tonsils (regions from which the extirpation of the plant is always most difficult), after various methods of treatment had been tried without results, a cure was apparently effected by smoking cigarettes. Chiari, however, tried the same remedy, in one of his cases, without good result. This would seem to suggest that in Klebs' case some constitutional habit was corrected, or some systemic or local condition set in, to arrest the disease, the use of the cigarettes being merely adventitious. In Guinier's case, the local measures were aided by correcting a menstrual disorder and the administration of general remedies for the strumous condition which existed.

At best, the disease is an exceedingly obstinate and persistent one, and requires much of patience and persistence, both on the part of the patient and the physician. The local destruction is to be accomplished with great care and minuteness of detail in thoroughly eradicating every vestige of the disease, and even then,

apparently, it is not always possible to assure a patient that the cure is a radical one. Thus, in Gumbiner's cases, recurrence took place even as late as five years. This still further seems to emphasize the importance of general measures of treatment, in connection with local applications.

CHAPTER XV.

HYPERTROPHY OF THE LINGUAL TONSIL.

THAT hypertrophy of the lymphatic tissue in the glosso-epiglottic fossæ might be the source of definite morbid symptoms was first suggested by Heymann[1] in a somewhat casual reference to a case seen by him, and also a similar instance observed by Stoerk. A more definite account of the affection was given in a report of a case by Betz,[2] while still later observations have been made by Heymann,[3] Curtis,[4] Rice,[5] Babcock,[6] Robinson,[7] Richardson,[8] Kersting,[9] and others.

ETIOLOGY.—We have already discussed, in the chapters on the faucial and pharyngeal tonsils, the general subject of the causation of hypertrophic changes in lymphatic tissue. Practically the same general rule applies to the lymphatic tissue at the base of the tongue. In this region, however, the follicles are displayed in a broad layer, involving the floor of the two glosso-epiglottic fossæ, and do not aggregate themselves into the thick masses, such as are found between the faucial pillars. For this reason, perhaps, the hypertrophic changes do not result in the development of those large, spongy masses which are found between the pillars of the fauces and in the vault of the pharynx. It is, moreover, a disease essentially of adult life, the symptoms rarely if ever manifesting themselves in young children, the youngest case which I have seen being that of a young lady aged eighteen. In a series of cases reported by Swain[10] the ages range from sixteen to fifty-seven, the average being thirty-three, while Ruault[11] reports cases which range from eighteen to forty-five. Lymphatic changes, as we have seen, belong essentially to child life. Hence, I think, we must conclude

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[1] Berlin. klin. Woch., 1877, p. 764.
[2] Monatschr. f. Ohrenheilk., 1879, p. 22.
[3] Berl. klin. Woch., 1881, p. 393.
[4] N. Y. Med. Jour., 1884, vol. xl., p. 510.
[5] N. Y. Med. Record, 1886, vol. xxix., p. 493.
[6] Southern California Practitioner, 1887, p. 127.
[7] N. Y. Med. Record, 1888, vol. xxxiii., p. 133.
[8] Jour. of the Amer. Med. Ass'n, 1889, vol. xii., p. 119.
[9] Verhandlung der physic.-med. Gesellschaft, n. s., vol. xxiii.
[10] Deut. Arch. f. klin. Med., 1886, vol. xxxix., p. 504.
[11] Archives de Laryngologie, 1887–88, vol. i., p. 193.

that, whereas the morbid process in the tissue commences in early life, the symptoms do not manifest themselves until later years.

It occurs far more frequently in females than males, thus apparently reversing the rule which obtains with reference to the faucial tonsils. It is probable that hypertrophic changes in this tissue might be much more frequently observed in young children, if sought for, than the above statement would seem to indicate; but in early life, the throat, as a rule, is by no means as sensitive, and as quick to appreciate morbid changes as is characteristic of adult life. Hence the same amount of hypertrophy of the lingual tonsil, which might be the source of an exceedingly annoying train of symptoms in an adult, would cause but trifling annoyance in a child.

The starting-point of the trouble may lie in an attack of diphtheria, scarlet fever, or in any of the acute infectious diseases, as is shown by clinical observation, and also by the fact that hypertrophy of this tissue is very frequently found in post-mortem examinations after the exanthemata. In most cases, however, it is probably a chronic process from the start, differing from other chronic inflammatory diseases in the fact that its course is not usually marked by recurrent attacks of acute inflammation, although both Ruault [1] and Hagen [2] have observed instances of acute inflammation in this tissue.

PATHOLOGY.—As we have already learned, the meeting of the epiblast and the hypoblast at the isthmus of the fauces, in the development of the fœtus, is attended with a deposit of lymphatic tissue, which seems to form a girdle, as it were, in this region, encircling the isthmus, as was first observed by Biekel; [3] the lymphatic tissue of the vault of the pharynx, or the pharyngeal tonsil, forming the upper portion of the girdle, the faucial tonsils forming its sides, while the circle is completed below by the similar structures found in the glosso-epiglottic fossæ. The existence of these structures, and their similarity to the faucial tonsils, was recognized by Morgagni, Wharton, Schaffenberg, and others of the earlier writers, although their true character was not understood until Kölliker [4] demonstrated them to be composed of lymphatic tissue, and closely allied to Peyer's patches. The mucous membrane of the dorsum of the tongue is quite rich in muciparous glands. In that portion, however, which extends from the papillæ circumvallatæ to the epiglottis they are so thickly distributed as to form an almost continuous layer, although they vary considerably in different

[1] Loc. cit. [2] Schmidt's Jahrbuch, 1888, vol. ccxx., p. 223.

[3] Virchow's Archives, vol. xcvii., p. 340.

[4] "Manual of Human Histology," Sydenham Soc., London, 1854, vol. ii., p. 29.

individuals. According to Ostmann,[1] there are from thirty-two to one hundred. Each individual gland is easily recognized, standing out somewhat prominently from the mucous membrane. In the centre of each projection, the minute orifice of the duct can often be seen with the naked eye. This duct opens into a wide flask-like cavity, lined with a prolongation of the mucous membrane from the orifice. Beneath this, we come upon a layer of large, rounded blind follicles or lymphatic bodies, imbedded in a delicate fibrous matrix, the whole gland being inclosed in a fibrous capsule (see Fig. 24). We thus find the pouch-like cavity of each muciparous gland completely invested by lymphatic tissue, thus constituting an individual secreting organ, in which the bulk is very largely made up of lymph tissue, and therefore one which is especially liable to become the seat of morbid changes, as we have seen in connection with the faucial and pharyngeal tonsils.

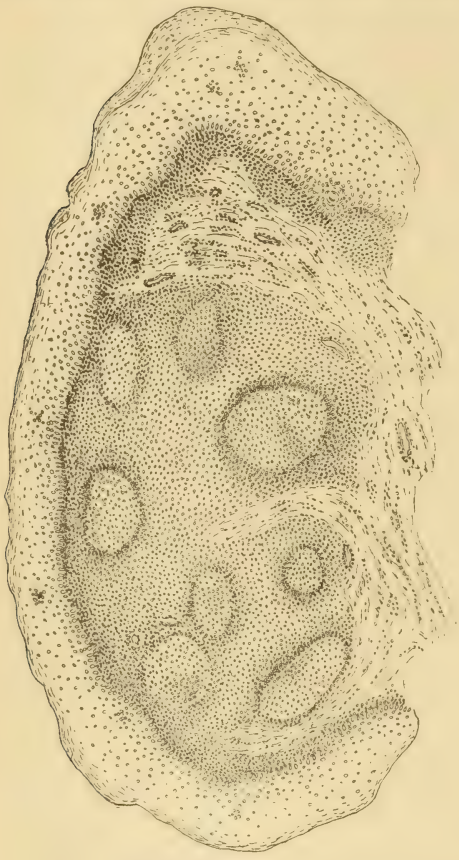

FIG. 24.—Microscopic Structure of Enlarged Lingual Tonsil.

SYMPTOMATOLOGY. — A limited amount of hypertrophy in this region is an exceedingly common condition, and one which ordinarily gives rise to no symptoms whatever. I am disposed to think that in most instances the annoying or distressing symptoms which this condition causes are present only when the hypertrophy is sufficient to more or less completely fill the glosso-epiglottic fossæ and impinge upon the crest of the epiglottis. When this occurs, there is a sense of fulness in the throat, with tickling and irritation, under the influence of which the patient constantly endeavors to clear the throat. Cough also is present in a majority of instances, a dry, irritating, hacking cough, attended with no expec-

[1] Virchow's Archives, vol. xcii., p. 119.

toration as a rule, in that the secretion from the diseased tissue is but limited in amount, and decreased rather than increased by the lymphatic hypertrophy. This diminution of secretion, of course, results from the obliteration of the mucous follicles by the encroachment of the lymphatic tissue. Hence, a feeling of dryness in the fauces is by no means an infrequent symptom. Hoarseness or loss of voice, if such be present, is the result of independent causes, and not of an enlarged lingual tonsil, although the voice is weakened and tires easily. This is not appreciated so much in ordinary conversation as in the prolonged exertion of public speaking, or in the exercise of the higher powers of the voice in singing. Indeed, the singing voice may be completely destroyed, without any apparent abnormal condition in the laryngeal cavity. This is due purely to the mechanical interference with the movements of the epiglottis, impairing no special register of the voice, and yet the upper notes, of course, are those which are taken with the greatest difficulty. A feeling of uncertainty, or lack of confidence in the voice, is especially noticeable with singers suffering from this condition.

A patient is rarely able to nicely locate his symptoms, and yet occasionally he complains of the sensation of a foreign body impacted directly at the base of the tongue. Deglutition is not often impaired, and yet quite a constant symptom is what has been called "empty swallowing," viz., a disposition to swallow when the throat is empty. In a case reported by Robertson,[1] of a female aged thirty-two, the hypertrophy attained unusual proportions, and seemed to imprison the epiglottis, as it were, in such a way that food made its way into the air passages. The symptoms continued two years, during the latter six months of which the patient abstained entirely from animal food. In a case reported by McBride[2] the epiglottis was so completely embedded in the mass that the examination was only completed by prying it out with the probe.

The whole train of symptoms are somewhat dependent upon the general habit, and are especially liable to be the source of annoyance in those patients in whom the nervous temperament is predominant. This, of course, explains the greater frequency with which the disease comes under our notice in females. As a rule, the symptoms are somewhat persistent, and yet there is a special liability to their exacerbation as the result of disturbance of the stomach, constipation, or any condition which tends to produce hyperæmia of the mucous membrane of the upper air tract. Moreover, the symptoms are notably aggravated with impairment of the

[1] British Med. Jour., 1887, vol. ii., p. 1,101.

[2] Edinburgh Med. Jour., 1887, vol. xxxiii., part i., p. 211.

general health, weariness, overwork, or any condition which taxes the nervous system.

Among the rare symptoms reported are tinnitus aurium, headaches, irregular neuralgic pains, dyspnœa, and spasm of the glottis: It is difficult to understand how any of these can be the direct result of an enlarged lingual tonsil, unless possibly we except spasm of the glottis, which may occur, although of course this would be an exceedingly rare event. As a rule, I think we shall find that the most constant and characteristic symptoms of the condition are the irritation and tickling in the throat, with the persistent and annoying cough, while the other manifestations are somewhat irregular and inconstant.

DIAGNOSIS.—It is not always an easy matter in any given case presenting with symptoms referable to the throat to determine definitely, and with certainty, where the source of the disturbance lies. No examination of such a case is complete, I think, without an exploration of the whole of the upper air tract from the anterior nares to the trachea. This examination should, as a rule, enable us to locate, with a considerable degree of certainty, the efficient cause of such symptoms as may be present. Our knowledge of diseased conditions of the lymphatic tissue at the base of the tongue is of such recent date that it can scarcely be considered superfluous to say that no examination of the upper air tract is complete which does not take into account the possibility of an hypertrophied lingual tonsil being the cause of faucial irritation, a throat cough, or impairment of the voice.

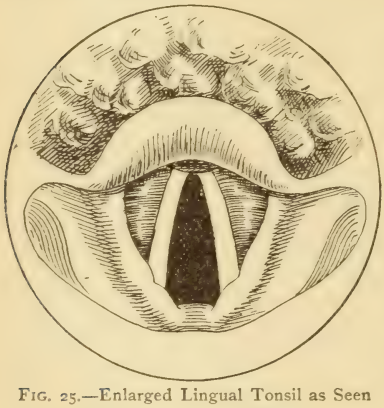

FIG. 25.—Enlarged Lingual Tonsil as Seen in the Laryngoscopic Mirror.

The examination is necessarily made by means of the laryngeal mirror, which will reveal the glosso-epiglottic fossæ more or less completely filled with a mammillated, somewhat cone-shaped mass, of a pale pinkish color, and separated in the median line by a sulcus, which marks the site of the central ligament. The crest of the epiglottis will be seen raised upon, and in some cases apparently embedded in, the apex of the hypertrophied mass (see Fig. 25). In one of Ruault's cases there were three lobes, but, as a rule, we find a somewhat symmetrical mass in each fossa, although an equal amount of hypertrophy upon each side is not constant. I think it is well to make the examination, not only with the tongue

protruded, but with the tongue *in situ*, as in the latter position the amount of impingement upon the epiglottis is more clearly estimated.

I know of no method of determining with absolute certainty that the lingual tonsil is the source of the symptoms, and yet I have frequently observed that, when the tongue is drawn forward in such a way as to separate the hypertrophied tissue from the crest of the epiglottis, a sense of relief from faucial irritation is experienced by the patient.

A somewhat ingenious diagnostic suggestion is made by Seifert,[1] who, after locating sensitive points, made an application of cocaine, producing anæsthesia, thus for the time giving entire relief to symptoms.

PROGNOSIS.—The condition is not a grave one, and involves no special danger to the general health, or to the integrity of the air passages below, and yet of course any persistent cough is not only a source of apprehension, but may exert a deleterious influence on the delicate tissues of the lungs. The morbid changes in the lingual tonsil develop very slowly, and probably in most instances have existed for a considerable period, giving rise to no symptoms, and these only manifest themselves finally when the general health of the patient is impaired or the nervous system over-taxed from some cause. Curiously enough, however, when the diseased organ commences to be a source of annoyance, the symptoms do not disappear by treatment directed to the general condition.

TREATMENT.—In early life, as we know, preparations of iodine have a notable effect in diminishing lymphatic hypertrophies. In adult life, however, their action is not so immediate or efficacious, and yet Swain reports excellent results from the topical use of a solution of one part of iodine, with ten of iodide of potassium, in a hundred parts of glycerin. Farlow[2] obtained excellent results in the use of acetic acid, McBride with nitrate of silver, Curtis with chromic acid and Vienna paste.

The indications for treatment here are the same as in the faucial or pharyngeal tonsil, and consist in the ablation of the diseased tissue. In my own experience this cannot be accomplished by local applications, although undoubtedly marked temporary relief can be afforded by nitrate of silver, tincture of iodine, or any active astringent. The question arises, then, as to the best method of destruction or ablation. Robertson,[3] Gleitsmann,[4] and others, make use of the galvano-cautery. This device answers an

[1] Berliner klin. Woch., 1887, vol. xxiv., p. 344.
[2] Boston Med. and Surg. Jour., Feb. 2d, 1888.
[3] Loc. cit.
[4] N. Y. Med. Record, 1887, vol. xxxiii., p. 757.

efficient purpose undoubtedly in the smaller growths, but, where the mass is large, a number of applications will be required. The process is a painful one, results in an exceedingly sore throat, which persists for a considerable period, and, moreover, there is no little danger of wounding the epiglottis. My own experience with the galvano-cautery has been such as to lead me to abandon its use in these troubles. Porcher[1] reports a case operated upon by Mackenzie's tonsillotome, while Roe[2] advises that the growth be pared off with the bistoury or cut with curved scissors.

One serious objection to cutting instruments in this region lies in the fact that we not infrequently find a number of large veins distributed about these growths, the cutting of which may result in troublesome if not serious hemorrhage. Moreover, it is a somewhat delicate operation to cut with accuracy at the base of the tongue. I think, therefore, that we should resort to the potential or chemical caustic, and cutting instruments, with hesitation. I have found, in my own experience, that the cold-wire snare is not only more easily manipulated and more efficient than any of the devices above referred to, but that its use is attended with but trifling hemorrhage. The instrument that I prefer is the nasal polypus snare known under my name,[3] the tube of which, being of flexible metal, can easily be bent to the proper curve, viz., to about the sixth of a circle.

Before operating, a twenty-per-cent solution of cocaine should be applied, and, although this does not completely anæsthetize, it notably diminishes the pain. This can be applied by the probe or by the laryngeal spray.

In operating, the patient is directed to hold the tongue well protruded, between the thumb and fore-finger, in the usual manner. The snare being held in the right hand, the loop is adjusted over as much of the growth as is feasible, with the aid of the laryngeal mirror, held in the left hand, and the mass severed. This procedure is to be repeated until the whole mass is extirpated.

The removal of the growth, of course, is followed by a complete disappearance of symptoms, although the patient may have more or less pain for several days following. For the first day or two after the operation the food should be of bland and unirritating quality, and the use of salt, pepper, vinegar, etc., entirely interdicted. A certain amount of relief can be afforded by directing the use of gum arabic, marshmallow, or the lactucarium lozenges sold in the drug stores under the name of the Pâte Aubargier. This last, by

[1] Med. News, Phila., 1889, vol. liv., p. 307.
[2] Jour. Amer. Med. Ass'n, 1889, vol. xiii., p. 171.
[3] See vol. i., fig. 108.

the way, is an excellent remedy for the relief of the cough and throat irritation in those cases in which operative interference is declined. Hot water or slightly astringent gargles also afford a certain amount of relief here, as do also the mint preparations, either in the form of the peppermint lozenge or administered in a cough mixture. If the cough is severe, and does not yield readily to other remedies, a lozenge containing a small amount of codeia or opium may be administered. In this connection, mention should be made of the varicose condition of the veins at the base of the tongue, the symptoms of which, to a certain extent, resemble the enlargement of the lingual tonsil, as mentioned by Roe,[1] Lennox Browne,[2] and Manon.[3] An examination with the laryngeal mirror easily reveals the large blue veins, coursing through the tissues at the base of the tongue. The indications for treatment of this affection is in the use of the actual or chemical cautery.

[1] Loc. cit.

[2] "The Throat and Nose and their Diseases," 3d ed., London, 1890, p. 222.

[3] Thèse de Bordeaux, 1887.

CHAPTER XVI.

DIPHTHERIA.

DIPHTHERIA is an acute infectious disease, which results either directly or indirectly from the entrance of a specific germ into the system, giving rise to a somewhat virulent form of blood-poisoning, while at the same time there occurs usually at the point where the germ enters the system an active acute inflammatory process, which assumes the form of a diphtheritic inflammation. It occurs endemically, epidemically, and sporadically; and while no age is exempt from an attack, in the large majority of instances it is met with in children.

It should be stated in the commencement that we make a distinction between the terms "diphtheria" and "diphtheritic inflammation," using the former to express the disease, while the latter is restricted to the peculiar form of local inflammation which occurs in the fauces or such other locality as may serve as a point of entrance of the virus.

In the present consideration we shall confine ourselves entirely to that form of disease in which the peculiar inflammation develops primarily in the fauces; although it is a well-recognized fact, both from a clinical and pathological point of view, that a diphtheritic membrane may develop not only upon the mucous membranes of other portions of the body, but upon open wounds and ulcerated surfaces, as well as in the kidneys and other viscera; in other words, we restrict the use of the term "diphtheria" to that disease which is characterized by the occurrence of a primary diphtheritic inflammation in the mucous membrane of the fauces.

I am disposed to regard diphtheria as somewhat closely analogous to the continued fevers or exanthemata, in that the blood-poisoning gives rise to a febrile disturbance which is continuous to a degree, while the faucial inflammation may be regarded as the characteristic eruption which accompanies the disease. The analogy, however, fails to this extent; that whereas the exanthems are self-limited and run a definite course, we can assign no definite period to the febrile disturbance in diphtheria. The somewhat regular and definite course which attends the development and exfoliation

of the diphtheritic membrane, on the other hand, would seem to sustain the analogy.

THE DUALITY OF CROUP AND DIPHTHERIA.—One of the first problems which present themselves for discussion is the question as to the relation which exists between croup and diphtheria; or, more properly speaking, between croupous laryngitis and faucial diphtheria. The anatomical differences between a croupous and diphtheritic inflammation, as taught by Virchow,[1] Billroth,[2] Wagner,[3] and others, have already been discussed in a previous chapter,[4] the one resulting in a fibrinous exudation deposited entirely upon the surface of the mucous membrane, while in the other the exudate permeates the meshes of the tissue to such an extent as to result in a localized necrotic process.

In a large proportion of cases of diphtheria, death results from suffocation due to the formation of a false membrane in the larynx or air passages below. Now, while the faucial exudation conforms anatomically to Virchow's original description of a diphtheritic membrane, the exudation in the larynx and trachea assumes more the form which he describes as croupous. On the other hand, cases are observed in which a croupous membrane forms in the larynx without the occurrence of a diphtheritic inflammation in the fauces. In the former class of cases it is claimed by those who advocate the identity of the two diseases that the diseased process, both in the fauces and the air passages below, is diphtheritic in character, and these cases are often designated as pharyngo-laryngo-tracheal diphtheria. Those who advocate the duality of these diseases, on the other hand, claim that the latter group of cases constitute an entirely independent disease, viz., a croupous laryngitis, which bears no relation whatever to diphtheria.

From a purely pathological point of view, it is certainly difficult to establish the duality theory, in that all pathologists agree now in the assertion that, whereas Virchow's original teaching as to the differences between these two forms of inflammation is undoubtedly correct, yet the two merge into one another in such a way that it is impossible to establish any definite dividing line; in other words, that we meet with cases of fibrinous exudation which cannot be said to belong to either form.

While this teaching of pathological investigation must be accepted, I am still of the opinion that from a clinical point of view the two diseases are distinct, although all will concede, I think, a

[1] "Handbuch der Pathologie," vol. i., p. 292.
[2] "Surgical Pathology," Amer. ed., N. Y., 1883, p. 312.
[3] "Manual of General Pathology," Amer. ed., N. Y., 1883, p. 265.
[4] Vol. i., pp. 55 and 56.

certain definite relation. A croupous exudation in the larynx which follows or accompanies a diphtheritic exudation in the fauces, differs in no essential degree, pathologically, from one which occurs independently of the faucial disease. The activity of the pathological process in the former case is perhaps somewhat more active than in the latter, and, as Prudden[1] has shown us, in the upper portion of the larynx there are minute areas in which the exudate is closely adherent to the parts beneath, and seems to penetrate somewhat the superficial epithelium and even the mucosa. These areas of adherence, however, diminish in size and number in the lower portion of the larynx. In no case, however, as far as I know, has there been observed a true, diphtheritic inflammation in the larynx or parts below which assumes anything like the actively efflorescent type resulting in tissue necrosis which is observed in the fauces.

I am disposed to think that all fibrinous exudations in the upper air passages, whether it be a simple follicular tonsillitis, a croupous tonsillitis, a croupous laryngitis, or a diphtheritic membrane, are due to the active presence of some micro-organism, although at the present writing the Klebs-Loeffler bacillus as the cause of diphtheria is the only one which has been recognized. This I believe to be undoubtedly true of idiopathic cases, and is probably true also of traumatic cases, the false membrane in these latter being due not directly to the activity of the inflammatory process, but to the fact that a mucous membrane in a state of active acute inflammation affords a more favorable nidus for the development of a germ than one in a state of health; in other words, a disease germ, lodging upon an inflamed mucous membrane, is arrested and reproduces itself with more or less activity; whereas a healthy membrane affords none of the conditions favorable to its development. This view explains many of those cases in which a fibrinous deposit seems to result from an exposure to cold, or to follow an acute inflammation resulting from traumatism, such as the inhalation of hot steam, etc.

From a clinical point of view, the laryngeal complication of diphtheria differs in no essential degree from that of an ordinary case of croupous laryngitis. Pathologically, however, we find the membrane in the larynx permeated by the Klebs-Loeffler bacillus, which is absent in the ordinary form of laryngeal croup. On the other hand, cases are not infrequently met with which present all the characteristics of an ordinary case of true diphtheria, and yet in which the characteristic bacilli are entirely lacking. These cases are ordinarily designated under the term "pseudo-diphtheria."

[1] Amer. Jour. Med. Sciences, 1889, vol. xcvii., p. 461.

Aside from this pathological distinction there is practically no marked difference, either in the course or prognosis, between the two forms of the disease.

It is perhaps not an easy matter to explain why in a case of diphtheria the inflammatory process in the fauces should be diphtheritic in character, while the morbid changes in the larynx and parts below should assume the croupous type, other than to suggest, perhaps, that the mucous membranes of the larynx and trachea, for some anatomical reason, do not favor the development of a diphtheritic process. The clinical fact, however, seems clearly established that the bacillus of diphtheria does set up two different pathological processes respectively in the fauces and in the parts below. As far as we understand these processes, however, it is a difference of degree rather than character, the croupous deposit being a stage practically in the development of a diphtheritic inflammation. Furthermore, if we have this croupous membrane developing in the larynx, unattended by a diphtheritic process in the fauces, it would seem to establish the fact that croupous laryngitis is a distinct disease from true diphtheria, both from a pathological and clinical point of view, while its distinction from pseudo-diphtheria seems also clearly established on clinical grounds.

That there is a definite relation between croup and diphtheria seems to be suggested by all clinical observations. What this relation is, however, can only be for the present a matter of speculation. That the germ which gives rise to a croupous inflammation is an attenuated form of the Klebs-Loeffler bacillus constitutes a very attractive theory, which, however, pathological investigation heretofore has failed to substantiate. That some such relation as this will be established seems by no means an improbable result of further investigation.

HISTORY.—That diphtheria existed in ancient times is clearly shown by frequent references by the early writers on medicine to an exceedingly grave disease of the fauces which, occurring usually in an epidemic form, resulted in extensive ulceration of the parts and usually proved quickly fatal by suffocation. In the time of Hippocrates it seems to have been known as the Egyptian evil, while Aretæus[1] describes the disease under the name of the Syriac ulcer, its origin having been attributed to both Egypt and Syria, and the affection being regarded as entirely ulcerative in character. This latter view of the disease seems to have been the prevalent one up to the sixteenth century, although Galen[2] makes casual reference to membrane being expelled from the fauces. In later

[1] "De Causis et Signis acutorum Morborum," lib. i., cap. 9.

[2] "De Locis Affectis," lib. i., cap. 9.

times, however, its membranous character seems to have been recognized by Villa Real,[1] Cortesius,[2] Baillou,[3] and others.

The epidemic character of the affection is clearly shown by the fact that the literature of the subject during the seventeenth and eighteenth centuries is mainly confined to descriptions of extensive invasions of what was undoubted diphtheria which visited various European countries. Thus, more or less extensive epidemics in Great Britain have been described by Blair,[4] Fothergill,[5] Starr,[6] and Huxham;[7] in Germany by Michaelis;[8] and in Sweden by Wilcke.[9] In New England it is probable that the disease appeared as early as 1659,[10] although the first really authentic report is that of Douglass,[11] who described an epidemic occurring in 1735.

Dickinson[12] also made a like report. In Spain a number of epidemics have been described by Villa Real,[13] Herrera,[14] Casales,[15] and Nunnez.[16] In Italy more or less malignant epidemics have been described by Carnevala,[17] Sgambati,[18] and Broncoli.[19] In Paris we have records of epidemics by Astruc,[20] Chomel,[21] Navier,[22] Grandvil-

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[1] "De Signis, Causis, Essentia, Prognostico, et Curatione Morbi Suffocantis," Compluto, 1611.

[2] "Miscellaneorum Medicinæ Decades Denæ," Messanæ, 1625.

[3] "Epidemiorum et Ephemeridum," 1640, lib. ii., p. 201.

[4] "Observations on the Practice of Physic," London, 1713.

[5] "An Account of the Sore Throat Attended with Ulcers," London, 1748.

[6] "An Account of the Morbus Strangulatorius": Letter from John Starr, M.D., to C. Mortimer, M.D., read May 24th, 1750: Philosophical Transactions, London, 1752, vol. xlvi., p. 435.

[7] "Dissertation on the Malignant Ulcerous Sore Throat," apud Essay on Fevers, 3d edition, London, 1757.

[8] "De Angina Polyposa Membranacea," Göttingen, 1778.

[9] "Diss. Med. de Angina Infantum," Upsala, 1764.

[10] "Bibliographical Sketches by Graduates of Harvard University," Cambridge, 1873, vol. i., p. 91.

[11] "The Practical History of a New Epidemical Eruptive Miliary Fever with an Angina Ulcusculosa," which prevailed in Boston, New England, in the years 1735 and 1736.

[12] "Observations on that Terrible Disease Vulgarly Called the Throat-distemper," etc. Letter to a friend, London, 1740.

[13] Loc. cit.

[14] "Tractatus de Scientia, Causis, Præsagio, Curatione Faucium et Gutturum Anginosorum," etc., Madrid, 1615.

[15] "De Morbo Garrotillo Appellato," Madrid, 1611.

[16] "De Gutturis Ulceribus Anginosis," Seville, 1615.

[17] "De Epidemico Strangulatorio Affectu," Neapoli, 1620.

[18] "De Pestilenti Faucium Affectu," Neapoli, 1620.

[19] "De Populari Horribili ac Pestilenti Gutturis et Annexarum Partium Affectione," etc., Neapoli, 1622.

[20] "Lettre sur l'Espèce de Mal. de Gorge gangreneux qui a regné parmi les Enfants," 1748; Paris, 1748.

[21] "Sur l'Espèce de Mal. de Gorge gangreneux," etc., Paris, 1749.

[22] "Dissert. sur plusieurs Maladies populaires," etc., Paris, 1753.

liers,[1] and others. In addition to the above we have records in the same period of epidemics occurring in Switzerland, Portugal, Austria, and other countries, thus indicating the great prevalence and virulence of the disease both in the northern and southern portions of Europe.

These writers clearly described the clinical history of the affection, but still failed to appreciate its definite character, although the latter became the subject of much discussion. During this period the affection was designated under the various names of croup, angina, cynanche, angina trachealis, and cynanche trachealis, but was most frequently described as gangrenous sore throat.

It is interesting to note that in the early part of the present century, one of the members of the Bonaparte family having fallen a victim to its ravages, a prize was offered by the first Napoleon to stimulate research in this direction, which resulted in valuable contributions by a number of French authors. In 1818 an epidemic of the affection occurring at Tours in France was carefully investigated by Bretonneau,[2] the results of his investigations being published in the famous memoirs. Bretonneau's researches were notable not only for the acumen which characterized his investigations, but also for the fact that he designated the affection as "diphtherite," a name which has been practically adopted into our nomenclature. Bretonneau originally adopted this term on the ground that the disease was inflammatory in character and purely local. In a subsequent memoir[3] Bretonneau conceded the truth of Trousseau's[4] claim, that the disease was a constitutional affection and not a local inflammation, and therefore that the term diphtheria was more appropriate.

Following Bretonneau, a number of contributions were made by Continental, English, and American physicians, in which the systemic character of the disease was emphasized, and especial attention was called to the various sequelæ which were liable to occur after an attack. In this manner the clinical features of the affection seem to have been fairly well established in the first part of the century, although its definite histological character still remained undetermined. In 1867 Buhl[5] discovered that the

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[1] "Description des Maux de Gorge epidemiques et gangreneux," Paris, 1768.

[2] "Des Inflammations speciales du Tissu muqueux et en particulier de la Diphtherite, ou Inflammation pelliculaire connue sous le Nom de Croup, de l'Angine maligne, de l'Angine gangreneuse," etc., Paris, 1826.

[3] Archives gén., 1855.

[4] Archives gén., vol. xxi., p. 541, and vol. xxiii., p. 338.

[5] Zeitschr. für Biol., vol. iii., p. 341.

false membrane was permeated with a fungous growth; he seems, however, to have been uncertain whether this was peculiar to the diphtheritic process. In the following year the announcement was made by Oertel[1] of the presence of a micrococcus in the exudation which belonged to this disease alone; a view which was subsequently confirmed both by the direct observations and inoculation experiments of Trendelenburg,[2] Nassiloff,[3] Recklinghausen,[4] and others, and notably by the researches of Wood and Formad,[5] who still further carried on a series of interesting culture experiments with the diphtheritic microbe. Our knowledge of this feature of the disease was completed on the announcement by Klebs[6] and Loeffler[7] of the definite microscopic characters of the bacillus which is peculiar to the diphtheritic process, and which is generally known now by the name of the Klebs-Loeffler bacillus.

ETIOLOGY.—An attack of diphtheria is undoubtedly the direct result of the lodgement upon the faucial mucous membrane of the specific bacillus, or the Klebs-Loeffler bacillus, where, finding a favorable nidus for its development and propagation, it sets up an inflammatory process at the point of arrest, which assumes the diphtheritic type. The assertion has been made by Wood and Formad,[8] and others, that the microbe is not only found in the exudation but also in the blood, from which it was assumed that the constitutional symptoms of the disease were due to its presence in the circulation. Since the definite microscopic character of the Klebs-Loeffler bacillus has been recognized and accepted, all pathologists unite in the view that this microbe does not make its way into the circulation. The systemic infection, therefore, is necessarily accounted for by the theory first advanced by Cheyne[9] that the pathological process in the mucous membrane of the fauces gives rise to a ptomaine, and that the constitutional symptoms of the disease are due entirely to the presence of this product in the blood. This seems to be clearly shown by the experiments of Brieger and Fraenkel,[10] who subjected a culture of the bacillus to filtration and subsequently injected the filtrate, from which the bacilli were entirely separated, into rabbits, producing an attack of diphtheria. It is interesting to note that the ptomaine thus injected into the lower animals produced an attack of systemic

[1] Aertzl. Intelligenzbl., 1868, No. 31. [2] Arch. für klin. Chir., 1869, vol. x., p. 720.
[3] Virchow's Archives, vol. l. [4] Virchow's Archives, vol. l., p. 552.
[5] National Board of Health Bulletin, 1882, supplement 17.
[6] Verhandlungen des Congresses für innere Medicin, Wiesbaden, April, 1883, pp. 142 to 145.
[7] "Mittheilungen a. d. kaiserlichen Gesundheitsamte," vol. ii., 1884.
[8] Loc. cit. [9] Brit. Med. Journ., 1887, vol. i., p. 504.
[10] Berliner klin. Woch., March 17th, 1890.

diphtheria without the localized inflammation or false membrane, thus indicating that the local morbid process is only excited by the presence of the Klebs-Loeffler bacillus, while the blood-poisoning is clearly due to the ptomaine.

Predisposing Causes.—The disease is essentially one of childhood, by far the largest number of cases occurring under the age of ten; thus, in 70,000 fatal cases returned by the register-general of England[1] there were, in round numbers—

Under 1 year of age,	6,300
From 1 to 5,	31,500
" 5 " 10,	18,200
" 10 " 15,	600
" 15 " 25,	3,500
" 25 " 45,	2,450
Over 45	1,750

while in a compilation made by Billington,[2] of 14,688 fatal cases reported at the Board of Health of New York during ten years, there occurred—

Under 1 year of age,	1,214
From 1 to 5,	9,622
" 5 " 10,	3,212
" 10 " 15,	311
" 15 " 25,	140
" 25 " 45,	124
Over 45,	65

two of the cases over forty-five being between the ages of 85 and 90.

We thus learn from the English statistics that about 54 per cent occur under the age of five, while the American statistics show about 70 per cent as occurring during this period of life.

In the report of the Michigan State Board of Health for 1885, 356 fatal cases were reported, of which there were—

Under 1 year of age,	3
From 1 to 5,	115
" 5 " 10,	35
" 10 " 15,	67
" 15 " 25,	26
" 25 " 45,	9
Over 45,	1

thus showing about 33 per cent as occurring under the age of five.

Those influences which predispose to the development of catar-

[1] Lancet, London, August 3d, 1878. [2] "Diphtheria," New York, 1889, p. 17.

rhal diseases have an undoubted effect upon the prevalence of diphtheria, for, while it prevails in all climates and in all seasons of the year, it is a notable fact that it is far more frequently observed in the colder portion of the temperate regions, its frequency diminishing as we approach a tropical climate. Moreover, while it prevails to a greater or less extent throughout the year, a larger number of cases are met with during the damp and cold months of spring and fall; thus, during a period of thirteen years extending from 1874 to 1886 there were reported at the New York Board of Health 18,688 fatal cases of this disease; of these there occurred—

In January,	1,895
" February,	1,613
" March,	1,589
" April,	1,474
" May,	1,488
" June,	1,414
" July,	1,246
" August,	1,126
" September,	1,171
" October,	1,618
" November,	1,995
" December,	2,059

We thus find that 10,769 cases occurred between October and March, inclusive, while during the six warmer months there occurred but 7,919. The fact of the greater prevalence of diphtheria during the colder months is in part explained, I think, by the greater prevalence of catarrhal colds during this period; for, as already stated, while I do not believe that there is any direct connection between a simple catarrhal affection and a croupous or diphtheritic exudation, yet a mucous membrane in a state of active acute inflammation affords a far more favorable lodgement for the development and propagation of a disease germ than does the same membrane in a state of health. A very important factor of the increased prevalence of diphtheria during the damp and cold months undoubtedly lies in the fact that our houses are much more tightly closed, and such infectious germs as may result from defective sewerage make their way into the atmosphere and are retained in the sleeping and living rooms of children, while during the summer months they would more easily escape into the outer world. In the same manner defective hygienic surroundings or conditions which weaken or impair the general health and lessen the resisting power of the system undoubtedly predispose somewhat to an attack of the disease.

As will be easily inferred from what has been already said, I regard an attack of acute inflammation of any portion of the upper air tract as constituting a somewhat active predisposing cause of the disease, in the manner already indicated. As bearing on this point, Gonzalez[1] reports that during an epidemic of diphtheria in Madrid he put 156 children in private practice on the use of chlorate of potash, and in but a single instance was there a case of diphtheria, and that he attributed to neglect in the administration of the drug.

Perhaps a still more active predisposing cause than acute inflammation is the existence of enlarged faucial tonsils, and, in a less degree, enlarged pharyngeal tonsils. I do not think that the danger to which a child with enlarged faucial glands is subjected can be overestimated, in that these large ragged masses of lymphatic tissue lying in the fauces afford a most favorable site for the lodgement of disease germs, whether of diphtheria, croup, scarlet fever, or any of the germs which make their primary entrance into the system in the current of inspired air. This has been a matter of such frequent clinical observation on my own part that it seems to me it is a point worthy of more general recognition.

Methods of Dissemination.—Diphtheria occurs endemically, epidemically, and sporadically. Thus, it may affect a limited community from localized causes, it may prevail over a wide district, or it may attack individuals. Again, it is both contagious and infectious. No fact probably in the study of this disease has been more clearly established than that a case of diphtheria cannot arise *de novo;* in other words, that the presence of a specific germ is necessary for the causation of the disease.

What the primary origin of this germ may be can only be a matter of speculation. The localities favorable for its generation, however, are well recognized. These are cess-pools, privy vaults, and the sewers of great cities, and all places which are permeated by a foul atmosphere, dampness, and especially such as are shut off from sunlight. Undoubtedly the most favorable culture ground of the germ is to be found in the sewers of great cities, and the persistency of its generation in these localities, spreading as they do oftentimes over many miles of territory, shows not only its marvellous powers of propagation, but its exceeding great vitality.

Recognizing the fact that whatever region affords a favorable site for the development and propagation of the germ necessarily proves a source of danger to those exposed, we may practically place a child suffering from the disease on the same basis as the

[1] Archivos de Medicina y Cirugia de los Ninos, Ano iii., No. 30.

infected sewer. In other words, a germ lodging in a child's throat reproduces itself with as great, if not greater, rapidity than occurs in the underground conduits. In each case the atmosphere is liable to be poisoned to a greater or less extent by emanations from one or the other culture grounds. Where the germ has its origin in the sewers it makes its way into the outer world through broken pipes, defective traps, or some imperfections in the sewage system of the house, and permeating the living or sleeping rooms of the child, lodges upon some portion of the upper air passages, giving rise to an attack of the disease. In the same manner the germ having its origin in a morbid process in the fauces of a child suffering from the disease escapes into the surrounding atmosphere and thus proves a menace to such children as may be exposed to it.

Whatever the direct source of the germ may be, its method of dissemination is oftentimes obscure and insidious. In many instances, however, we are enabled to directly trace the origin of a given case or epidemic in such a way as to form a somewhat definite opinion as regards the special manner in which the virus is disseminated. To recount the immense number of cases recorded in medical literature where the disease has been traced to its origin would be an unnecessarily laborious task. During the past ten years I have seen a large number of cases in one of the newer quarters of our city, in which, with scarcely an exception, the origin of the infection was traced to the fact that the houses being built on new ground had so far settled during the first years of occupancy as to break the sewer connection. Instances of this kind are of not infrequent occurrence, and many such cases have been reported in medical literature.

It was a somewhat popular theory at one time that the disease might have its origin in the presence of mould on the walls of living or sleeping rooms, the view being that the mould itself might be the pathogenic germ, Taylor[1] citing a number of cases which seemed to support this view. It is probable, however, that the mould simply affords a favorable nidus for the lodgement and propagation of the true diphtheritic bacillus.

We find diphtheria prevailing in epidemic form and with great virulence in rural districts and those far removed from the elaborate sewerage systems of large cities. In these instances the origin of the infection may be found in some local causes, such as neglected privy vaults or cess-pools, or it may be conveyed over long distances from larger communities where a more favorable condition for its development exists. Earle,[2] in an investigation of diphtheria

[1] Journal of Laryngol., vol. i., p. 228.

[2] Trans. of the Ninth Internat. Med. Congress, vol. iii., p. 440.

as occurring in the rural communities in the Northwestern States of this country, demonstrates that the disease may occur in the mountainous and prairie districts with as great malignancy as in the cities, and furthermore that the contagious element may be transported long distances, by railway and merchandise, or by the currents of air. This latter vehicle of transmission was very clearly shown by Airy[1] who explained the occurrence of a number of sporadic cases by the fact that the prevailing wind at the time of the outbreak, in each case, was from a specific region where an epidemic was prevailing, in each case the wind blowing with unusual force in the stated direction.

We speak of the sewers of large cities as being a prolific source of the disease, and these are probably the most active cause in the majority of cases, and yet it is a well-recognized fact that stagnant filth or decaying animal or vegetable matter in any locality may be the origin of the contagion. The germ having been in this manner primarily developed, however, it assumes such a form and possesses such a persistent vitality that it may be transported through long distances, by railways or other methods of land transportation, in baggage, in clothing, in letters, or may be carried by the current of air in the prevailing winds. When we consider that the germ maintains its activity and vitality even after transmission through long distances, it would seem that numberless communities throughout the land were constantly subjected to great danger in this way. It must be borne in mind, however, that in this wide dissemination the chances of its reaching a favorable nidus are immensely diminished. That the germ may be conveyed in drinking-water without impairment of vitality is clearly shown by the cases reported by Newton,[2] Menzies,[3] and others, in which large groups of individuals were attacked after drinking water whose source was clearly shown to be polluted by decaying filth.

In the same manner the occurrence of cases of diphtheria in a large number of families obtaining their milk from the same vendor shows clearly that the germ may be transmitted in this way. Instances of this have been reported by Cameron and Mackenzie.[4] Cole[5] traced an epidemic of this kind to milk supplied by a diseased cow. It is a well-known fact that cows are subject to diphtheria. Klein,[6] in investigating the subject, demonstrated that, when the cow is infected, the milk contains the specific germ. Later re-

[1] N. Y. Medical Record, vol. xxii., p. 41.
[2] N. Y. Medical Record, vol. xxiv., p. 391.
[3] Thèse de Paris, 1881.
[4] N. Y. Medical Record, vol. xxiii., p. 195.
[5] Australian Veterinary Journal, Feb., 1882.
[6] Occidental Medical Times, vol. iv., p. 345.

search, however, has failed to establish the fact. Hence the source of infection in these cases must be found in some extraneous source, such as diluting the milk or washing the cans with infected water, for, as Osler[1] has shown, milk supplies a favorable nidus for the growth of the diphtheria bacillus.

Cows, dogs, pigs, cats, sheep, pigeons, chickens, and other of the lower animals are not infrequently attacked by diphtheria, and hence may be a source of contagion. Thus, Wheeler,[2] Turner,[3] and others report epidemics of this affection, of a malignant type, which were associated with similar epidemics in pigeons, fowls, cats, and other of the lower animals. The disease seems to have been contracted from association with or from eating these animals. In one instance, observed by Turner, a domestic cat seems to have contracted the affection from a child in the family.

We have thus learned that the origin of the infectious germ of this disease is either in the sewers or other localities where decaying organic matter exists, and furthermore that it may be transmitted by the clothing, in drinking-water, in milk, in letters, or may be carried in the air. In other words, that its vitality depends in no degree upon the absence or presence of moisture, for when dry it floats in the atmosphere and is easily carried by the wind through long distances. We have furthermore learned that it may be communicated by the lower animals. An additional source of the disease is found in individuals suffering from it. As before stated, the throat of a child suffering from diphtheria becomes for the time a very prolific culture ground for the propagation of the specific germ which is the cause of the disease. The germ thus developed, when transferred to the fauces of a healthy child, is capable of producing the same disease.

We have spoken of diphtheria as a highly contagious and infectious disease. All authorities agree on this point. What the difference is between infection and contagion has never, I think, been definitely stated. Conventionally, however, I think, we usually understand contagion to mean the transmission of a disease by conveyance through the atmosphere, clothing, or some other vehicle, while infection is usually understood to mean transmission of the disease by direct contact. While, therefore, the disease is both contagious and infectious, I think it is questionable if its contagion is as active as that of scarlet fever, typhus fever, small-pox and even some others of the exanthems.

We have spoken of the diphtheritic germ as being one of very

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[1] Medical News, Philadelphia, 1891, vol. lviii., p. 553.

[2] American Practitioner and News, 1887.

[3] Journal of Laryngol. and Rhinol., vol. i., p. 328.

great vitality. The evidence of this is shown in the fact that it has existed and reproduced itself in the sewers of all our large cities practically since their construction. In other words, our great cities are underlaid by a huge system of culture-beds for the diphtheritic bacillus, which, moreover, are tapped by numberless openings throughout our streets. Notwithstanding this fact, the deaths from diphtheria average perhaps one in a thousand of population each year. While, therefore, I have no disposition to detract in any way from the exceeding gravity of this disease and its dangers, it seems to me the inference here is that the specific germ which causes the disease does not possess the very active and vital infectious qualities which we are accustomed to attribute to it. This view, I think, is somewhat borne out when we examine the disease from a purely clinical point of view. It occurs endemically and epidemically, as we have seen, and, morevoer, when it breaks out in a family it is exceedingly liable to attack a majority of its younger members. In certainly a very large proportion of these cases the individuals which fall victims to the disease are infected from the common source, although undoubtedly in many instances they contract it directly from those previously affected. Of course I do not regard this as an entirely safe theory to act upon, or one which it would be wise to express to the parents where children have been attacked with the disease, and yet it seems to me it is a view which we, as physicians, might entertain as lending a certain amount of encouragement to us in our efforts to check the further spread of the affection when it has invaded families in our care.

Lancry,[1] Dumez, and others, from the observation of certain isolated cases which support the theory, have argued that the contagious area of an individual case is limited to but a few feet. When we consider to what great distances the virus has been transported through the air, this view must be considered absolutely untenable: in the very nature of the subject no limit of contagion can be established for the disease: and yet, on the other hand, the activity of the contagion is to a certain extent limited, as before stated, and this I think is very clearly explained by the observations of Osler,[2] who finds the breath of a patient suffering from the disease, entirely free from the specific germ. The teaching of this is very clear that the germ is imprisoned by the natural moisture of the parts, and does not therefore necessarily permeate the atmosphere which surrounds the patient. The principal channel, therefore, by means of which the virus passes from the patient is in the act of expectoration, blowing the nose, etc., since following these acts the material discharged loses its moisture and becoming

[1] St. Louis Med. and Surg. Journal, 1887, vol. lii., p. 192. [2] Loc. cit.

dry the germ assumes such a shape as that it is easily transmitted through the atmosphere by means of the clothing or in other ways. If this view be correct it aids us much in the sanitary management of any given case.

While therefore we are justified in regarding the contagious character of the disease as limited in this degree, that it is highly infectious no one will question, meaning by this term the direct transfer of the morbid material from the diseased throat to another individual. This has been verified in numberless cases where a patient has coughed in the face of the physician or an attendant, and especially in those instances of misdirected devotion where the physician has endeavored to clear the air passages after tracheotomy by means of suction. The only requisite in these cases is that the virus shall reach a mucous surface, an abrasion not being necessary.

PATHOLOGY.—*The bacillus.*

Since 1868, when Buhl[1] first announced the bacterial origin of diphtheria, all observers have confirmed this view. In most instances, however, the micro-organism observed was the ordinary streptococcus of suppuration. It remained for Klebs[2] in 1883 to definitely isolate the specific germ, and for Lœffler[3] in 1884 to confirm Klebs' observation by culture experiments, thus demonstrating that the disease is due to the active presence of the micro-organism now generally designated as the Klebs-Lœffler bacillus. Later investigation, however, showed this bacillus to be present only in a certain number of cases, thus Babes[4] found the bacillus in all of 42 cases of diptheria; D'Espine[5] found it present in all of 14 cases; Ortmann[6] in 15 out of 16 cases; Spronk, Wintgens, and Vandenbrink[7] in all of 7 cases; Roux and Yersin in all of 15 cases; Kolisko and Paltauf[9] in 50 cases; Zarinko[10] in 18 out of 20 cases; Bock[11] in 50 out of 52 cases; Sörensen[12] in 7 out of 10 cases; Escherich[13] in 20 out of 22 cases; Tangl[14] in all of 18 cases; Brieger and Frænkel[15] in all of 22 cases; Prudden[16] in 11 out of 12

[1] Loc. cit.

[2] Verhandlungen des Congresses für innere Medicin, Wiesbaden, April, 1883, pp. 142–145. [3] Op. cit. [4] Zeit. für Hygiene, vol. v., p. 177.

[5] Rev. méd. de la Suisse Romande, vol. viii., p. 49.

[6] Berliner klin. Woch., 1889, p. 218.

[7] Centralblatt für allg. Path. und path. Anat., 1890, vol. i., p. 218.

[8] Annal. de l'Institut Pasteur, 1888, vol. ii.

[9] Wien. klin. Woch., 1889, vol. ii., p. 147.

[10] Inaugural Dissertation, Kiel, 1889. [11] Zeit. für Hygiene, vol. viii., p. 134.

[12] Nordiskt medicinskt Arkiv, 1886, vol. xviii., No. 25.

[13] Centralblatt für Bakteriologie, Jan. 2d, 1890, p. 8.

[14] Centr. für allg. Path. und path. Anat., 1890, vol. i., p. 795.

[15] Berliner klin. Woch., 1890, p. 241. [16] Medical Record, vol. xxxix., p. 445.

cases; Welch and Abbot[1] in all of 8 cases, and Johnson[2] in 8 out of 9 undoubted cases of diphtheria, and in 1 out of 5 anomalous cases. Lœffler also failed to discover the bacillus in all his cases, arguing that in those instances in which it was absent it may have perished and been eliminated before the death of the patient. Late investigations, however, showed that in a certain proportion of cases the Klebs-Lœffler bacillus is absent, in consequence of which the theory was adopted that we have two forms of the disease, true diphtheria and pseudo-diphtheria.

Lœffler subsequently discovered the existence of another bacillus, which belongs essentially to pseudo-diphtheria; the difference between the two micro-organisms being that the true bacillus when inoculated upon the lower animals produced death from diphtheria, while the pseudo-bacillus inoculation experiments were negative. The true bacillus is a motionless germ, sometimes straight and sometimes curved, about the length of the tubercular bacillus, but double its thickness. Under high powers of the microscope it is shown to be made up of from three to four segments and has club-shaped ends. The pseudo-bacillus is identical with the above, with the single exception that the ends are not club shaped. The inoculation experiments with the pseudo-bacillus being negative, it is thus seen that it cannot be demonstrated to be the cause of pseudo-diphtheria, yet all authorities unite in regarding it as such. This view is practically substantiated by the further experiments of Roux and Yersin,[3] who have suggested that the pseudo-bacillus and the true bacillus diphtheriæ are different grades of the same organism, as shown by the following experiments: by attenuating the bacillus of true diphtheria by cultivation in a current of air at high temperature a germ is produced which microscopically and by culture experiments presents the same reactions as the pseudo-bacillus. This attenuated virus c n be made to regain, as it were, its virulency by mixing it with an attenuated erysipelas virus. When such a mixture is inoculated into an animal death takes place in a short time, and examination reveals the lesions characteristic of true animal diphtheria. At the same time inoculation with the attenuated erysipelas virus and the attenuated diphtheritic germ into separate animals gives entirely negative results, thus demonstrating apparently that the mixture of the two fluids in some unknown way acts in such a manner as to rejuvenate the diphtheritic poison.

It is further argued by these observers that, as a germ present-

[1] Johns Hopkins Hosp. Bull., 1891, vol. ii., p. 25.
[2] Bacteriological World, 1891, vol. i., p. 691.
[3] Annal. de l'Institut Pasteur, vol. iv., p. 385.

ing all the characteristics of the pseudo-bacillus is found normally in the mouth, this germ, innoxious in itself, may become virulent through the action of some other pathological process upon the economy. This might explain cases of true diphtheria following immediately upon an attack of scarlet fever, although research has shown that the large proportion of these cases are pseudo-diphtheria and not true diphtheria.

The Diphtheritic Process in the Fauces.—I am disposed to regard diphtheria as primarily a local disease, as originally taught by Oertel.[1] The specific germ, lodging upon the mucous membrane, reproduces itself more or less rapidly and penetrates the epithelium, setting up an active inflammatory process in the membrane, characterized by dilatation of blood-vessels, transudation of serum, and the escape of leucocytes, the whole apparently being set in play by the presence of the specific micro-organism. There is active proliferation of epithelial cells coincident with the escape of fibrin, which latter upon exposure to the air undergoes coagulation, forming a false membrane. The fibrin as it coagulates engages in its meshes large numbers of the newly developed epithelial cells. There is thus established a pathological process which differs in no essential form from the ordinary croupous inflammation, except from the presence of the specific micro-organism, which is found in large numbers in the false membrane, and penetrates somewhat sparsely into the tissues beneath. The morbid process, however, rapidly passes into what is termed a diphtheritic inflammation, in that with the rapid escape of fibrin from the blood-vessels in the mucosa proper it undergoes coagulation, not only upon the surface, but throughout the whole thickness of the membrane. As the direct result of this excessive activity, together with the contraction of the fibrinous bands, tissue necrosis sets in; the vitality of the false membrane, as well as the larger portion of the mucous membrane proper, is destroyed by pressure; the necrotic tissue accordingly separates itself from the parts beneath, and is thrown off in the form of a slough, and a new false membrane takes its place, or resolution may occur. This, in a somewhat general way, constitutes the morbid process which is met with in the fauces in an ordinary case of diphtheria. In certain cases the localized morbid action goes no further than in the formation of the croupous membrane, viz., a false membrane which is formed on the surface of the mucous membrane. This differs, of course, in no way from the ordinary croupous tonsillitis, except in the presence of the specific bacillus. In the large majority of instances the deposit occurs primarily upon the tonsils, and subsequently the pseudo-

[1] Ziemssen's "Cyclop.," vol. i., p. 571 et seq.

membrane extends to the faucial arch and the soft palate, and backward to the pharynx. In rare instances it extends into the nasal cavity proper. The tendency, however, is to the air passages below, a certain proportion of cases developing an exudative process in the larynx, trachea, and bronchi. As before stated, when the disease extends to the air passages below, the local inflammation assumes practically the croupous form, the diphtheritic inflammation, viz., that which is characterized by the involvement of the mucous membrane proper in the fibrinous coagulation, occurring only in somewhat widely separated areas, which diminish in number and extent as we go downward, the bronchial process being practically a croupous inflammation.

Changes in the Viscera.—As a rule the changes which are met with in the visceral organs are such as may occur in any of the continued fevers. The mucous membrane of the bronchial tubes usually shows notable hyperæmia throughout its whole extent, while local extravasations are by no means uncommon. Among the rarer lesions are œdema and broncho-pneumonia. The heart cavities may contain coagula and the muscular structures show degenerative changes. The kidneys in most of the fatal cases are notably enlarged and show evidences of local extravasations, while the tubules are the seat of inflammatory changes. The liver and spleen in a certain proportion of cases are engorged, while the latter organ may be soft and friable. In addition to the above visceral changes, minute extravasations are occasionally found in the meninges and superficial portions of the brain and spinal cord.

SYMPTOMATOLOGY.—The stage of incubation of the disease varies from two to five days, although instances have been recorded in which the development of the disease was delayed for two weeks after a traceable source of contagion. Where the contagion is conveyed through the atmosphere the period of incubation is apt to be much longer, whereas, when the disease is the result of direct infection, the morbid process manifests itself in a much shorter period. This is shown by direct clinical observation, and is also substantiated somewhat by the fact that in the inoculation experiments on the lower animals both the local morbid process and the constitutional affection develop in from twelve to thirty-six hours.

The character of the febrile disturbance, together with the local morbid process in the fauces, would seem to suggest something of a relation between diphtheria and scarlatina. Moreover, it is a well-known fact that where epidemics of the two diseases occur at the same time, the type of each is apt to assume a somewhat aggravated form. That they thus react unfavorably one upon the other

is undoubtedly true; but that this establishes a definite relation between the affections is scarcely tenable, in that the faucial affection in scarlet fever assumes an ulcerative rather than a pseudo-membranous type, although in many cases undoubtedly diphtheria may occur in connection with scarlet fever. In such cases the throat affection assumes the pseudo-diphtheritic form. In rare instances, however, a true diphtheria occurs, as shown by the presence of the Klebs-Lœffler bacillus.

Diphtheria may assume an exceedingly mild form, or, again, it may assume an unusually malignant type, according to the extent of the local inflammatory process or the degree of blood-poisoning that may exist. Either one or both may develop in a given case. Moreover, this may depend to a certain extent on the character of the prevailing epidemic. During the last forty years, diphtheria has been especially prevalent in this country; in certain epidemics the disease has assumed a very mild form, while others have been characterized by an exceedingly malignant type of the affection, in which the mortality has been very great. It is also an observable fact that during any given epidemic the activity of the virus seems to diminish by its distribution. In other words, the severity of the disease is much lessened during the latter period of the epidemic invasion.

For convenience of consideration, we divide the forms that the disease may assume into three:

1st. The mild form, which is characterized by the development in the fauces of a true diphtheritic membrane, which does not extend into the larynx, and in which the systemic disturbance is of a mild character. These cases recover.

2d. The typical form, in which the diphtheritic membrane forms in the fauces and subsequently extends into the larynx and trachea, and in which, while there is notable blood-poisoning, the cause of death is usually suffocation.

3d. The malignant type, in which the prominent feature is the profundity of the blood-poisoning, which causes the death of the patient in the early stage of the attack, and before the local disturbance in the fauces has assumed any great prominence.

In addition to the above three classes we might notice that form which is sometimes described under the misnomer "catarrhal diphtheria." Not infrequently during the prevalence of an epidemic of diphtheria cases are observed which present all the constitutional symptoms of this disease, and yet in which the only local manifestation is a catarrhal inflammation of the fauces. It has been questioned whether these cases bear any definite relation to the prevailing epidemic. I am disposed to think that they do, and

that they are really caused by the presence of a bacillus—not the Klebs-Lœffler bacillus, perhaps, but the bacillus of pseudo-diphtheria, which, as we know by the experiments on the lower animals, does not produce a diphtheritic membrane at the point of inoculation. Masucci[1] reports a case which is interesting in this connection, in which a catarrhal sore throat, accompanied by febrile disturbance and asthenia, was followed by strabismus, ptosis, paresis of the palate and lower extremities, and paralysis of the laryngeal adductors—symptoms which fully warranted the observer in the assertion that the disease was diphtheritic in character, although there was no exudation. On equally good grounds, Gubler and other French observers assert the existence of a catarrhal form of the affection.

The Mild Form.—This variety of the disease, as before stated, is characterized by the development of a typical diphtheritic membrane in the fauces, with a certain amount of febrile disturbance, indicating the presence of ptomaines in the circulation, and yet the membrane shows no disposition to extend beyond the tonsils, and the cases usually recover.

It is ordinarily stated that the prodromic stage of diphtheria is characterized by a certain amount of general *malaise*, with loss of appetite and depression of spirits. This may be present in a certain number of cases of the graver forms of the disease. Even in these, however, it is not infrequently absent, and is not recognizable in the mild form, the first symptom of which consists of chilly sensations, followed by general febrile disturbance, the thermometer showing an axillary temperature of from 100° to 101°. The skin is flushed, pulse quickened; there is loss of appetite, pains in the bones and the other indications of febrile movement. This is followed soon by a sense of uneasiness and stiffness about the throat with external tenderness, due to the enlargement of the cervical glands, together with pain in swallowing.

Cases of this kind afford an excellent opportunity for studying the development of a diphtheritic membrane in the fauces. During the first day there may be observed on the tonsils either a thin, bluish-white pellicle covering their whole surface or a number of small spots of the same color, which stand out somewhat above the surface of the mucous membrane, which is swollen and injected and presents the ordinary appearance of catarrhal inflammation, which involves the tonsils, the soft palate, and perhaps the wall of the lower pharynx. This hyperæmia is of a somewhat darker color than that which characterizes an acute inflammation. In other words, the venous hyperæmia seems to prevail over the

[1] Rivista clinica e terapeutica, Anno ix., No. 11.

arterial. If the exudative process is confined to one side of the throat, this hyperæmic condition may also be unilateral.

At the end of the first day or the beginning of the second, if the exudation has commenced in separate points on the surface of the tonsil, these will have extended so far as to completely cover this organ with a continuous membrane, which now takes on more of a yellowish aspect and becomes entirely opaque. Its surface presents a soft, velvety appearance, and it stands out more prominently from the parts beneath, showing notable thickness on inspection.

The further change in the membrane consists in perhaps a moderate amount of extension and piling up, as it were, of the fibrinous bands and the imprisoned epithelial cells which constitute the main portion of the exudate.

In the course of the second or perhaps on the third day a mucopurulent secretion, moderate in amount, makes its appearance on the surface and about the edges of the false membrane, which now becomes somewhat raised, and shows a manifest disposition to separate itself from the parts beneath, presenting a ragged aspect. By the end of the third day, or even sooner, the membrane, which heretofore has presented a bright yellow, velvety appearance, gradually turns to a bluish-brown color, indicating that the necrotic process has been completed, preparatory to the sloughing away of the exudation. The further changes which take place consist in the complete separation of the membrane from the parts beneath and its expulsion. This does not always occur *en masse*, as not infrequently it comes away in small particles or shreds, and gradually becomes thinner, until the reddened mucous surface is seen beneath.

The febrile disturbance, which was characteristic of the first two days of the attack, subsides notably toward the end of the second or the beginning of the third day, and by the fourth or fifth day usually has almost completely disappeared. The febrile disturbance in these cases seems to be coincident with the morbid process in the throat, which is of an active inflammatory character for the first two or three days, after which it becomes passive and local.

The whole course of an attack of this sort is usually completed in from ten to twelve days, the exudation disappearing and the parts beneath assuming a healthy aspect. If any forcible attempt is made to remove the membrane at the onset, it may reform promptly, although if left entirely alone it shows but a limited disposition to reproduce itself after the natural process of exfoliation.

To suggest why any given case of diphtheria should assume this form would only be a matter of speculation. That the specific germ which causes it possesses abundant vitality is shown by the

fact that an attack of diphtheria contracted from a mild case may assume a very malignant type, for this form of the disease is probably quite as contagious as the graver varieties. Moreover, it is quite as liable to be followed by the paretic and other *sequelæ* which occur after the severe cases.

I know of no means by which we can recognize this form of the affection as such, except by studying its progress. If at the end of the third day the febrile movement subsides and the tonsillar exudate shows no disposition to extend, and if furthermore no laryngeal symptoms have developed, little apprehension need be felt. Up to the end of the third day, however, any case of membranous formation in the fauces must necessarily be a source of grave anxiety, lest some of the dangerous features of the disease ensue.

The Typical Form.—Under this head we describe that form of diphtheria in which both the local morbid process in the fauces and the blood-poison are present, but in which the extension of the membrane into the larynx and trachea becomes the grave feature of the attack.

The onset of the disease is marked by either chilly sensations or a well-developed chill. If there are prodromic symptoms, they consist simply in a feeling of general *malaise*, with restlessness and loss of appetite. In young children, vomiting and even convulsions not infrequently occur. The systemic invasion is shown by general febrile disturbance, flushed skin, headache, and pains in the bones, together with scanty and high-colored urine. The patient is apt to be dull, depressed, listless, and somewhat unobservant. This is due rather to the blood-poison than the febrile disturbance, in that the latter as indicated by the thermometer is usually not much above 101° or 102°, thus indicating that the fever in diphtheria is of the asthenic rather than the sthenic type. The pulse, moreover, while notably accelerated, is apt to be somewhat feeble and thready even at the onset of the disease.

The throat symptoms develop almost coincidently with the febrile movement, the patient complaining of a sense of dryness and stiffness about the parts, with external tenderness and pain on swallowing, the lymphatics of the cervical region being invaded by the specific virus, usually within the first twenty-four hours.

If now we examine the fauces, we find on the first day much the same appearance as that already described as occurring in the mild form of diphtheria. Its development, however, I think here is somewhat more rapid. The exudation may commence as a thin pellicle, covering one or both tonsils, or it may commence in minute bluish-white spots, which at the end of a comparatively few

hours have taken on a yellowish color. This discoloration may occur even before these points have spread so far as to produce a continuous exudation covering the organ. Within the first twenty-four hours the tonsillar membrane is completed, and presents a bright yellow, efflorescent, thick, velvety membrane, covering one or both tonsils and standing out prominently above the mucous membrane beneath. This is highly injected and swollen, and presents all the evidences of acute catarrhal inflammation, except that the hyperæmia is of the venous type, as evidenced by the dark-red color, with a slightly bluish tinge. This discoloration extends somewhat to the soft palate, uvula and pharynx.

On the second day, or, at the latest, by the third, a muco-purulent discharge sets in, and the membrane shows evidences of a necrotic process, in its bluish-gray aspect and somewhat ragged edges, which now begin to stand out from the parts beneath. The membrane also shows a disposition to extend itself, spreading up toward the soft palate and uvula, and also into the pharynx. If in the former direction the palate becomes swollen, while the uvula may become œdematous, being swollen to several times its normal contour. As the necrotic process develops in the exudation, the parts are so constantly bathed with the muco-purulent discharge which accompanies the process that a close inspection even fails to clearly outline and define the condition and progress of the case. This is due not only to the amount of secretion poured out, but to the fact that the patient finds it exceedingly difficult to expel the secretions which accumulate. These are dried up by the current of air in respiration, and thus adhering closely, form an additional source of annoyance to the sufferer. The tongue, which at the onset is moist and slightly coated, now becomes dry and covered with a brownish, ill-looking fur. The breath becomes fetid, both from the local necrosis and from the retained secretions. The temperature, which at the onset ranges from 101° to 102°, by the third day generally goes down from one to two degrees. This seems to be due to the fact that the local disease in the fauces changes somewhat from an active inflammatory to a passive necrotic process.

Up to the end of the third day, as a rule, the gravest symptoms which develop in the patient are those due to the blood-poisoning which results from the septic absorption, together with the interference with proper nutrition which the morbid process in the fauces entails. The most serious aspect which the disease presents at this time lies in the danger of the false membrane developing in the larynx. This usually occurs at the end of the second or during the third day. In rare instances it is postponed until the fifth. This complication occurs, I think, not from a direct exten-

sion by continuity of tissue of the false membrane from the fauces to the larynx, but by the development of a new centre of infection in the parts below. The occurrence of this complication is first shown by the hoarseness or complete loss of voice which results from it. This is soon followed by dyspnœa, characterized by obstruction both to inspiration and expiration, although of course, in the nature of the case, the expiratory effort is accomplished with much more ease than inspiration. The development of dyspnœa is recognized by the ordinary symptoms characteristic of laryngeal obstruction, such as subclavicular and abdominal depression, cyanosis, etc. The laryngeal stenosis is mainly the result of the false membrane, although undoubtedly a certain amount of paresis in the respiratory muscles of the larynx contributes no little to the symptoms. The occurrence of a deposit in the larynx is also evidenced by a recurrence of febrile movement. As Smith[1] tells us, the thermometric teachings in an attack of diphtheria are of no very great practical value. The onset of the disease is marked by an elevation of temperature, which subsides notably on the second or third day. The invasion of the larynx, however, is usually accompanied by an increased febrile movement, as indicated by a rise in temperature of one or two degrees.

The laryngo-tracheal exudation, as before stated, assumes the croupous type rather than the diphtheritic, although in a few scattered areas the fibrinous process extends into the mucous membrane proper. Its development is completed usually by the end of the second day from the commencement of the laryngeal symptoms. If life is prolonged for a sufficient time, the exudation may separate itself on the third or fourth day and be expelled, either in part or in a complete cast of the larynx and trachea. This is followed either by resolution or by reproduction of the membrane. In the faucial region a somewhat similar process occurs. The membrane is separated from the parts beneath, and is thrown off in shreds or in large masses, and here again resolution may occur, or a new membrane may form. The primary formation of a membrane in the trachea is dependent, as we have seen, on the morbid process in the fauces. If the tracheal membrane is expelled, its re-formation is to a certain extent dependent on the progress of the morbid process above. In other words, if the faucial exudation is progressing favorably at the time the tracheal membrane is expelled, there is less probability of a re-formation in the parts below than if the diphtheritic process above is in a state of activity. Ordinarily, we may say that the development and exfoliation of a diphtheritic membrane is a process extending through from five to

[1] Keating's "Cyclop. of the Diseases of Children," vol. i., p. 580.

seven days, and the clinical history of an ordinary case of this form of diphtheria which progresses favorably, and in which suffocation does not occur as the result of the tracheal exudation, covers a period of two weeks or longer.

The Malignant Form.—We apply the term malignant to that form of diphtheria in which the prominent symptoms are dependent upon the profundity of the blood poison. The prodromic symptoms are usually absent. The onset of the attack is generally marked by a fully developed chill or notable chilly sensations. Vomiting not infrequently occurs, and may persist for some time after it commences. Convulsions also are occasionally met with. The morbid process in the fauces differs in no marked degree from that of an ordinary attack of diphtheria. The febrile disturbance, which at first may be marked by a temperature of 101 or even 102°, usually disappears during the second day; and the further course of the disease is marked by a low temperature, or there may even be a total absence of febrile movement.

The prominent symptoms are those due to blood-poisoning. The patient seems to be overcome at the onset of the disease by the exceeding virulence and activity of the morbid material which enters the circulation. This is evidenced by the peculiar bluish-gray aspect of the skin, the dull eye, the listless, apathetic condition of the patient, the failure to notice individuals or occurrences in the room; in fact the condition constitutes one of almost semi-coma. The pulse is rapid, feeble, and irregular; the urine is scanty and high colored, or it may be suppressed; the administration of food and drink is accomplished with considerable difficulty, not on account of any dysphagia or pain in deglutition, but rather from the general apathetic condition of the patient. This is due to the profound impression produced on the nerve centres by the blood-poisoning. This is still further evidenced in many instances by the occurrence of eclampsic symptoms or delirium, which is usually of the low, muttering, type. Another nervous symptom of some import, and which is to be explained in the same way, is the absence of tendon reflex. This is met with in all forms of diphtheria, but more particularly belongs to that which is characterized by excessive blood-poisoning.

If the patient survives to the third or fourth day, the local morbid process in the fauces may extend to the parts below and develop laryngeal stenosis; as a rule, however, a fatal issue ensues before the dyspnœic symptoms have developed sufficiently to contribute notably to the fatal termination. In other words, the disease seems to expend itself in the development of the poisonous ptomaines which give rise to the blood-poisoning, and mem-

brane formation is not a prominent feature of this type of diphtheria.

DIAGNOSIS.—As before intimated, I am disposed to regard diphtheria as being somewhat analogous to the exanthemata, the morbid process in the throat bearing the same relation to diphtheria as the characteristic cutaneous eruption does to the various exanthems. Furthermore, a dipthheritic process in the fauces presents certain characteristics and appearances which can and should be recognized, in certainly the large majority of instances, by gross inspection.

Many competent observers have taken the ground that a follicular tonsillitis is diphtheritic in character, notable among these being Jacobi.[1] A statement from such high authority as this must certainly carry great weight; and yet, while there may be a certain relation between tonsillitis and diphtheria, I believe from a clinical point of view that the two diseases are absolutely distinct. A tonsillitis presents small points of croupous exudation in the mouths of the crypts of the tonsils. These are bluish-gray in color, of a cleanly, healthy aspect, and constitute a process which remains croupous from the beginning, and never results in tissue necrosis. Furthermore, I have never seen a single instance of this milder affection which subsequently developed into diphtheria. The point is certainly an exceedingly important one; and, if my view is correct, we are enabled, on the recognition of a simple follicular tonsillitis, not only to relieve the family of the patient of much anxiety and apprehension, but may find it a source of no small satisfaction to ourselves, as physicians, that we are not called upon to deal with that graver form of exudative disease which, in so large a proportion of cases, baffles all our remedial efforts.

A diphtheritic membrane primarily makes its appearance in the very large majority of cases on the face of the faucial tonsils, where it is open to direct inspection. In rarer instances it makes its appearance on the pharyngeal tonsil, where it can only be inspected by the rhinoscopic mirror. This latter resource is unavailable, in most cases, in young children. When the membrane commences in the naso-pharynx it very soon extends to the level of, or below, the soft palate, in such a way as to bring it into direct view. On the first day it presents a thick, velvety appearance, rising above the surface of the membrane. It is of a bright yellow color, and lies upon a mucous membrane in a state of more or less active hyperæmia.

The only question of differential diagnosis that practically presents, is in the distinction between a croupous and a diphtheritic membrane. A croupous membrane is an exceedingly thin pellicle,

[1] N. Y. Med. Jour., vol. xlvii., p. 707.

of a bluish-white color and healthy aspect, in contradistinction to the soft, velvety appearance of the diphtheritic process. A croupous exudation develops on the surface of the epithelial layer of the mucous membrane; diphtheritic membrane extends into the tissues beneath it in such a way as to practically incorporate a large portion of the epithelial surface, or even the mucosa. The crucial test, I think, between a croupous and a diphtheritic exudation lies in this fact. If the parts are brought carefully into view and a proper light thrown upon them by means of the concave reflecting mirror (which I think should be used in every case where the slightest question of diagnosis exists), a slender probe deftly manipulated will enable the observer to test in each individual case this peculiar character of the membrane. On gently attempting to lift the edges of a croupous membrane it will be found that it can be easily separated from the parts beneath, leaving them intact. If the same attempt is made in reference to a diphtheritic membrane it will be found that it cannot be separated from the parts beneath without the rupture of blood-vessels or the tearing of tissue. This, of course, should be accomplished with the greatest nicety of manipulation, not only in order to definitely determine the character of the local process, but also in order to avoid unnecessary injury to the parts, as it is undoubtedly true that if a diphtheritic membrane is forcibly separated from the parts beneath blood-vessels are opened and an additional septic absorption may ensue therefrom.

We would thus lay an especial emphasis on the following points: A croupous membrane is thin, of a bluish-white color, with a shining, glazed surface, and is separable from the parts beneath; a diphtheritic membrane is thick, of a yellowish color, soft and velvety surface, and is closely adherent to the parts beneath.

After the second day of a diphtheritic process, when tissue necrosis occurs, this is evidenced by gross appearances, which are unmistakable. It assumes a bluish-black aspect, with ragged edges, and is attended with a more or less profuse muco-purulent secretion. The necrotic process, furthermore, is evidenced by the characteristic fetor. A croupous membrane remains croupous until the end, when it is exfoliated, either in a mass or in small particles. It is cleanly in aspect, healthy in color, and never attended with a muco-purulent secretion.

We have thus drawn the distinctions between a typical croupous membrane and a typical diphtheritic membrane, and these distinctions are available for diagnostic purposes in the very large proportion of cases which come within our observation.

Pathology teaches us, and clinical observation confirms the view,

that on rare occasions we may meet with instances of fibrinous exudation which possess the characteristics of both processes; or membranes which are on the dividing line between croup and diphtheria. It is on this ground that Virchow's original distinction between the two processes has been practically abandoned by so many investigators. But while pathology teaches us that the two processes may merge one into another in such a way that no absolute dividing line can be drawn in every case, clinical observation shows that in the very large majority of instances as they occur in practice, the distinction can be made by the gross appearances. It is, perhaps, somewhat fortunate that the doubtful clinical cases, viz., those which cannot be definitely assigned to either group, are apt to occur in late youth or in early adult life—a period when the susceptibility to laryngeal and tracheal invasion is very much diminished. Certainly this has been my own experience.

Something, perhaps, can be learned from the tendency of the membrane to spread throughout the fauces. In a follicular tonsillitis the exudation confines itself, as a rule, to the mouths of the crypts. Occasionally it spreads over the tonsil, still retaining its croupous character. When this occurs, it remains in this location during the whole course of the disease, and shows no tendency to extend. In the milder form of diphtheria we meet with cases in which the original deposit is limited to the face of the tonsil, never extending beyond; in these instances, however, the exudation presents the typical character of the diphtheritic process above described. Any membrane which, commencing on the tonsils, extends to the soft palate and uvula, is probably of a diphtheritic character.

Any question of differential diagnosis between a diphtheritic and an ulcerative process it would seem somewhat superfluous to raise. A mistake of this character can only occur from careless observation.

In view of the fact that the Klebs-Lœffler bacillus multiplies with unusual rapidity in culture experiments, it has been suggested that this might be useful in making a definite diagnosis in a doubtful case.

If a small portion of the membrane be placed in a culture tube filled with bouillon enriched by peptone, it will develop so rapidly that colonies of the bacillus on the surface can be recognized by the naked eye within twenty-four hours.

The subjective symptoms possess but a secondary diagnostic value in any given case as compared with the local process in the fauces. The febrile movement is somewhat uncertain and irregular. As a rule, that which is due to the disease itself is mild in character and is prominent but from two to three days. The sub-

sequent temperature changes are dependent somewhat on the development of secondary inflammatory processes in the air passages below, or perhaps in the kidneys or other viscera. Albuminuria is present in from fifty to sixty per cent of cases, and yet it must be borne in mind that this symptom also occurs in connection with croupous inflammations. The absence of tendon reflex is a symptom of undoubted diagnostic value, although probably present in a somewhat limited number of cases. The great prostration which attends the disease is shown by the rapid and feeble pulse and the general apathetic condition of the patient. This is a symptom of value, and yet it is common to all the continued fevers.

As a rule, I think our diagnosis should be based on the careful inspection of the localized process as it develops in the fauces.

It has been claimed that certain cases of diphtheria may develop primarily in the larynx or parts below, and subsequently extend to the fauces. I think this view is open to serious question, as I am disposed to the belief that the primary deposit has occurred in the pharyngeal vault, or some other portion of the upper air tract beyond the line of direct inspection. The extension of the membrane generally confines itself to the soft palate, uvula, and pharnygeal wall, and thence into the passages below. In a certain proportion of cases, it extends into the nasal cavity. This complication makes itself known primarily by the ordinary symptoms of nasal stenosis, and on the second or third day by the somewhat thick, ichorous discharge from the nostrils, which gives rise to excoriations of the muco-cutaneous surface, and still later by the appearance of the thick, fibrinous mass occluding the anterior nares. It has also been claimed that the disease may occur primarily in the nose, and subsequently extend to the parts below. I regard it as an almost universal law that the lymphatic tissue of the faucial and pharyngeal tonsils presents the most favorable nidus for the lodgement of the diphtheritic germ; and I regard this rule as so universal that I am disposed to think the primary origin, in all cases of diphtheria, is to be traced to the occurrence of a deposit on one of these three lymphoid masses. The so-called cases, therefore, of primary nasal diphtheria I should consider cases in which the primary deposit occurred in the vault of the pharynx, and that the nose became involved by extension.

PROGNOSIS.—The tendency to death in diphtheria is due to two causes, the activity of the blood poison and asphyxia from laryngeal and tracheal stenosis. In the mild form the systemic infection is limited in degree, and the false membrane shows no tendency either to extend beyond its original deposit on the tonsils

or to develop new centres in the parts beneath. The tendency to fatal issue, therefore, is largely eliminated from this form of the disease, and it runs its course in from ten days to two weeks and undergoes spontaneous resolution, unless a fatal issue is precipitated by some of the complications or *sequelæ* which are common to both the mild and graver forms of the malady. The most prominent of these are those referable to the heart, the kidneys, and the lungs. The cardiac symptoms, I think, are the indirect reuslt of the blood poison, which acts upon the nerve centres in such a way as to markedly impair cardiac innervation, while the blood poison undoubtedly acts directly to weaken the cardiac muscle. Dabney,[1] in an interesting discussion of the forms of cardiac disturbance in diphtheria, has described three varieties. In the first the pulse is rapid, feeble, and irregular throughout the course of the attack and afterward. This is undoubtedly due to the action of the blood poison upon the cardio-inhibitory nerve centres. In a second form the pulse becomes progressively feebler and slower, until it may reach as low as forty, or even thirty beats a minute. This seems clearly to indicate the action of the blood poison upon the cardio-accelerator nerve centre, thus giving free action to the inhibitory centre in the medulla. The third variety is the sudden failure of the heart, which may either occur during an attack of the disease or during resolution. This is the result of the enfeebling action of the blood poison upon the muscular structures of the heart. From the fact that post-mortem examinations in such cases usually reveal the presence of a clot in the cardiac cavities, it has been argued that this is the cause of the sudden heart failure. This, I think, most observers regard as a post-mortem condition, and that the heart failure is the immediate result of changes in the muscular tissue.

We thus find that the cardiac complications are the result of the blood poison, which, as we have seen, is not active in the mild form of diphtheria, and hence while these complications may occur in this form, they are far more liable to occur in the graver varity of the disease.

Furthermore, albuminuria, which we have referred to as a diag nostic symptom, and as present in a majority of cases of the disease, may in rare instances constitute a grave complication. As a rule, however, the renal changes are but temporary in character and rarely of serious import.

The other complications, such as bronchitis, pneumonia, and changes in the abdominal viscera, are not met with in the mild form of the disease.

[1] Virginia Med. Monthly, Nov., 1891.

In the typical form or in so-called laryngo-tracheal diphtheria, while a notable extent of blood poisoning is shown by the constitutional symptoms which develop, the tendency to death is in the main due to the development of the membrane in the larynx, with its resultant asphyxia. Woronichin,[1] in a very instructive and elaborately detailed analysis of 445 cases of diphtheria which were observed in the Elizabeth Hospital for Children at St. Petersburg during a period of nineteen years, shows that 279 were affected with faucial diphtheria without laryngeal implication, 63 had laryngo-tracheal diphtheria, while 103 were affected with the malignant type, or, as he designates it, *diphtheria phlegmono-gangrenosa*. In the mild type of the disease there were 90 fatal cases, thus indicating a death-rate of something less than 33 per cent. In the laryngo-tracheal form 55 died, the death-rate being 88 per cent. In the malignant type of the disease there were 95 deaths, a death-rate of about 92 per cent. These statistics, as we have seen, are not the records of epidemic cases, which, as we know, differ very markedly in their severity, but are the continuous record of cases of the affection treated in the hospital during this long period of years.

This classification evidently differs somewhat from that which we have adopted above, in that we have taken the ground that the mild cases of diphtheria are not especially fatal; and it is difficult to understand how Woronichin's reports should show a death-rate of 33 per cent, unless the affection assumed the malignant type in many of these instances. The somewhat interesting feature of the statistics is in the fact that but 63 cases of the typical or laryngo-tracheal form of the disease occurred in a total of 445, or something less than 15 per cent. This differs notably from the statistics of Lunin,[2] who in a total of 296 cases observed, met with 95 instances of laryngeal invasion, or something over 32 per cent, which is probably nearer the correct proportion as occurring outside of hospital practice. As regards the excessive death-rate reported by Woronichin in this variety of the disease, it should be noted that neither tracheotomy nor intubation was performed in any of his cases. The total death-rate in his cases was 55 per cent. In Lunin's it was about 56. That this is not an excessive hospital mortality is shown by the fact that of 606 cases[3] of the disease treated in the Hospital Trousseau in Paris for 1883 391 died, a death-rate of 64.5 per cent, while of 319 cases[4] treated in the Charité at Berlin in 1885, 208 died, a death-rate of 65.5 per cent.

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[1] Jahrbuch für Kinderheilkunde, 1887, vol. xxvii., p. 61.

[2] St. Petersburger medicinische Wochenschrift, 1885, n. s., vol. ii., p. 45 et seq.

[3] Revue mens. des Maladies de l'Enfance, February, 1884.

[4] Charité-Annalen, vol. x., p. 490.

The striking difference between the fatality of the disease as occurring in hospitals and at home is shown by the returns of the New York Board of Health, as quoted by Billington and O'Dwyer.[1] For eight years, extending from 1880 to 1887, the death-rate was but 42.62 per cent. The highest death-rate, occurring in 1884, was 49.47, while the lowest was in 1883, being 34.37. This occurred in probably the most crowded city in the world. In Boston during the same period the death-rate in each year varied from 26.44 to 35.07, the average being 30.88 per cent, the lessened mortality here being undoubtedly due to the fact that the poorer classes are not crowded together in large tenement houses to anything like the extent that prevails in New York.

The prognosis in the malignant form of the disease is clearly indicated by the excessive death-rate shown above. Thus, in Woronichin's cases it was 92.50 per cent, while in Lunin's it was 84 per cent.

It is not to be inferred from what has been stated above that the larynx is not invaded in the malignant form of the disease, because in many instances it is; but most frequently the septic infection is of such a violent type that the patient is overwhelmed by it at the onset of the disease, and succumbs in the course of a few days before the laryngeal invasion has developed to a sufficient extent to produce suffocative symptoms. Thus, of 103 of Lunin's fatal cases of the malignant form, 81 succumbed before the larynx was invaded. Age is always to be regarded as an exceedingly important factor in forming a prognosis. In Woronichin's cases the general mortality being 55 per cent, below the age of 4 it was 68.6; below the age of 8, 51.8; and above the age of 8, but 20 per cent. The explanation of this lies in the fact that very young children are not only more easily overpowered by the septic infection, but the danger of laryngeal involvement increases inversely with age. Moreover, a fibrinous exudation in the air passages is a much graver complication the smaller the part affected.

Our prognosis is also notably influenced by the character of the prevailing epidemic, the surroundings of the patient, the intelligence of the attendants, and such other circumstances as influence the course of any of the continued fevers. Moreover, it is to be borne in mind that cases which occur during an epidemic are more apt to assume the graver form than those which occur sporadically. In any given instance it is advisable for a physician to be somewhat guarded in giving a definite prognosis; for even a mild case of diphtheria is liable at any time to develop grave complications, and as long as the specific morbid process is present in the fauces

[1] "Croup and Diphtheria," New York, 1889, p. 138.

of a child the possibility of these complications must be kept in mind.

The extension of the membrane into the nasal cavity is to be regarded as a somewhat grave complication, not so much on account of the nasal stenosis which ensues, with its attendant discomfort, but from the fact that the propagation of the germ occurs in a cavity which very soon becomes practically closed. In this way a condition is established which is especially favorable to the development of septic infection. This may be explained not only by the imprisonment of the germ, but by the great vascularity of the Schneiderian membrane.

TREATMENT.—There are two important indications to be kept in mind in the management of any given case of diphtheria: these are, first, to control and counteract as far as possible the constitutional effect of the blood poison; and, second, to limit the extension of the local inflammatory process and to destroy its infectious quality. This latter indication is emphasized by the fact that the propagation of the bacillus after it first commences in the fauces constitutes a continuous process, by which new ptomaines are rapidly manufactured, which make their way into the general circulation, adding to the original septic infection. This view is scarcely borne out by the temperature range, which, as we see, falls notably on the second or third day. The febrile movement, however, must be regarded as the result largely of the inflammatory process, while the increased septic infection would be evidenced by a depression of the vital powers, and is thus attended by a lower temperature. If in any given case the primary septic poison has not been sufficient to destroy life during the first twenty-four or thirty-six hours, it seems a fair conclusion that if by our local measures we can destroy the infectious character of the local process in the fauces we have done more to arrest the further progress of the disease and to save the life of the patient than can be accomplished by any other method of treatment. In this point of view, the treatment of the local process in the fauces would seem to be the more important indication, and our ability to cope with this most fatal of diseases, in the main limited by the inefficiency of our methods and remedies in the management of the faucial affection. Unfortunately, in the present state of our therapeutic resources in diphtheria, this disability must be recognized in a large proportion of cases. This limitation, furthermore, is I think only in part explained by the fact that our materia medica contains no agent whose local action in destroying the septic character of a diphtheritic process can be relied on in all cases. I am disposed to think that in very many cases our failure to arrest the disease is to be explained rather by the fact that the

success of our local applications is balked by some other cause, such as the intractability of the patient, the extent of the diseased process when first seen, the failure on the part of the attendant to fully carry out directions, the infrequency of the applications, and possibly to a lack of thoroughness and nicety of manipulation in applying topical remedies.

Too much importance cannot be laid upon the value of a thorough illumination of the fauces, together with a convenient access to the parts, both for inspection and for local treatment. It is not sufficient to examine the child's throat by means of a candle held in front of the face; the illumination should always be accomplished, where feasible, by means of a light reflected into the fauces from the concave mirror, while at the same time the parts are thoroughly exposed by the deft manipulation of a tongue depressor, and not a table spoon, or such other domestic instrument as may be at hand. I do not think these points can be insisted upon too strongly. Even in young children, with the exercise of a moderate amount of patience and deftness of manipulation, a thorough examination can be obtained, with the parts well exposed, and not only can the extent and character of the disease be discovered, but the local treatment can be used with a thoroughness and nicety of application such as cannot be hoped for where these aids are neglected. With expert manipulation, moreover, the confidence of the child is secured, and maintained in such a way that the further treatment can be followed up very much more successfully than if at the first visit pain and discomfort has been given by the use of a swab or probang, or other measures which render the child averse to a repetition of the process.

Of course a certain amount of danger attends the treatment of a case of diphtheria, and it might be well to say here that this can be easily obviated, I think, by protecting the only parts which are vulnerable, viz., the eyes and mouth—the latter by a handkerchief and the former by large glasses.

Topical Applications to the Membrane in the Fauces.—Among the local remedies which possess special value in rendering inert a diphtheritic membrane, I should give the first place to some of the preparations of iron, the order of preference perhaps being the officinal liquor ferri persulphatis and the liquor ferri perchloridi. If the membrane is thin and not especially efflorescent, the latter may be diluted with from one to four parts of alcohol; this latter forming, as we know, the ordinary tincture of iron. In applying this remedy, the patient should be placed in such a position that the parts are rendered easily accessible and are fully illuminated, when a slender probe wrapped with a small pledget of cotton is

dipped in the solution and a small amount of the agent applied gently to the surface of the exudation. This is repeated until the whole of the membrane visible is thoroughly saturated with the iron. Moreover, the application should be made in such a way that the parts are in no degree injured and the application confined entirely to the exudation. This process need practically entail no discomfort to the patient; and hence, when a repetition becomes necessary, it is tolerated even by very young children without objection. It is a matter of great importance that no forcible attempt should be made to separate the pseudo-membrane from the parts beneath, as by any such process blood-vessels are ruptured and an open access to the circulation thus established which might be a source of additional infection.

If seen early enough in the progress of the disease, and when the exudation is still confined to the tonsils, we may hope, even by the first application, to rob the local process of much of its infective potency and limit its capacity for extension. The patient, however, should be seen a second time at least three or four hours later, when the same process can be repeated. The subsequent visits should be governed largely by the appearances noted. Very much depends on careful watching, and frequent repetition of the visits during the first two or three days of the attack. In a majority of instances, probably, it will be necessary that the patient during this period be seen at intervals not much greater than from four to six hours.

The value of this remedy was first published, I think, by Nelson,[1] and has received probably more universal indorsements since that time than any other single local agent. The action of the iron is practically to antagonize and intercept the localized fibrinous process, thus rendering inert the nidus in which the specific bacillus propagates. Its direct action upon the bacillus is probably somewhat limited.

Next in efficiency to iron I should place the use of lactic acid as a local agent. This may be used in a fifty-per-cent solution, the strength being increased or decreased according to its effect. It should be applied in the same way as the iron. Browne,[2] indorsing the recommendation of Nix,[3] Cheyne,[4] and Schutz,[5] advises that the membrane be more or less detached from the parts beneath, on the ground that we thus remove a source of infection. As before stated, I regard this proceeding as exceedingly perilous

[1] N. Y. Med. Jour., 1874, vol. xix., p. 54.

[2] "The Throat and Nose and their Diseases," 3d ed., London, 1890, p. 362.

[3] Lancet, London, Nov. 20th, 1886, p. 988.

[4] British Med. Jour., March 5th, 1887. [5] Prag. med. Woch., 1880, No. 10.

to the patient. Our local medicaments should be applied directly to the exudation in the effort to destroy its virulence.

Since Sternberg's observation of the disinfectant properties of the bichloride of mercury, this remedy has received extensive trial as a local application, Cheyne[1] advising the use of a solution as strong as 1 part in 500. I have no special knowledge of its efficacy used in this way; it certainly can have no effect on the inflammatory process, and cannot be expected to penetrate very deeply into the tissues for its action on the specific bacillus. Lunin[2] reports 43 deaths in 142 cases of the fibrinous form of diphtheria; 43 of these were treated by local applications of the bichloride of mercury, with 13 deaths. In both series, as we see, the rate of mortality was about 30 per cent. Its use in the form of an inhalation will be referred to later.

Carbolic acid or phenol has been used more or less extensively as a local application, but, I think, ordinarily in such weak solutions as to render it practically inert, notwithstanding the sweeping assertion of Roulin,[3] that by the use of douches and gargles of a solution of this agent no case need ever succumb. In order to do any good it should be used at least in from a 30 to an 80 per cent solution—in which case it undoubtedly possesses marked value, in that it penetrates the tissues deeply and destroys effectually. It is to be applied in the same manner as the tincture of iron, and with exceeding great care. The objection to it lies in the fact that it is somewhat painful, and, moreover, it is liable to injure the neighboring parts.

Among other destructive agents we find the galvano-cautery highly recommended by Bloebaum,[4] Henoch,[5] and others; nitrate of silver by Bretonneau,[6] Trousseau,[7] and most of the older writers; as well as hydrochloric acid, nitrate of mercury, and chloride of zinc by many observers.

The practice of cauterizing a diphtheritic exudation, however, is very properly abandoned in our day, both on account of the difficulty in limiting the action and the failure to notably modify the morbid process. Seifert[8] reports favorable results from the local application of a 5-per-cent solution of chinolin in equal parts of alcohol and water. Its action is purely antiseptic, and is probably the same as the stronger solutions of corrosive sublimate. Somewhat on a par with this remedy is to be placed resorcin, as re-

[1] Loc. cit. [2] Loc. cit.

[3] Soc. méd. pratique, Jan. 5th, 1888.

[4] Verhandl. d. Cong. für innere Med., Wiesbaden, 1888, vol. v., p. 432.

[5] Therapeutic Gazette, 1886, p. 603. [6] Loc. cit.

[7] "Memoirs on Diphtheria," New Sydenham Soc. Pub., London, 1859.

[8] Berliner klin. Woch., 1882, Nos. 22, 23, and 24.

commended by Lunin[1] and Jose Fruillet;[2] and bromine, which has been successfully used by Hiller,[3] Hesse,[4] and W. H. Thompson.[5] This latter is used generally in about a 15-per-cent solution, brushed gently on the parts, while weaker solutions are used as sprays and douches. Some years since pepsin, pancreatin, trypsin, and other digestive ferments were held in no little esteem as local applications to the membrane, the theory of their action being that they dissolved the exudation by a digestive process. The two latter were usually applied in a somewhat concentrated alkaline solution either by means of the brush or spray, or they were administered internally at frequent intervals. A piece of false membrane placed in a bottle of these solutions in the course of a few hours undoubtedly undergoes digestion, but it is difficult to understand how the somewhat ephemeral presence of such a fluid upon the membrane, when applied directly to it in *situ*, can have any notable effect. I am disposed to think the effect of these remedies is very largely theoretical, and certainly should not feel justified in losing valuable time by trusting to their uncertain action, although their use is indorsed by Chapin,[6] Van Syckel,[7] Smith,[8] and others. In the same category may be placed the papayotin, recommended by Bauday.[9]

In concluding this branch of the subject, I merely repeat that I should have little faith in any topical agent whose action was not to directly control both the fibrinous and the septic process, and as accomplishing this I think our dependence will be best placed in the order of preference, upon iron, lactic acid, a strong solution of carbolic acid, and possibly, in a limited degree, upon strong solutions of corrosive sublimate.

Ford[10] and others warmly commend the use of the peroxide of hydrogen as a topical application, by means of the spray and by inhalation. I have had no personal experience with this drug in diphtheria, but should hesitate to place sole dependence upon it in a case of efflorescent exudation.

Immediately upon the development of any symptoms which point to the extension of the false membrane to the lining membrane of the nose, it becomes a matter of importance to arrest the

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[1] Loc. cit. [2] Gaceta Med. Catalana, April 30th, 1887.
[3] Deut. med. Woch., 1882, p. 328.
[4] Deut. Arch. für klin. Med., 1885–86, vol. xxxviii., p. 479.
[5] "Jacobi on Diphtheria," New York, 1880, p. 201.
[6] N. Y. Med. Record, vol. xxvii., p. 257.
[7] N. Y. Med. Record, vol. xxvii., p. 207.
[8] Keating's "Cyclop. of the Diseases of Children," vol. i., p. 672.
[9] Weekly Med. Review, St. Louis, Dec. 10th, 1887.
[10] Personal Communication.

process. The accomplishment of this requires careful watchfulness and somewhat deft manipulation. In order to gain freer access to the parts, the turbinated bodies should be exsanguinated as far as possible by the application of a two-per-cent solution of cocaine, after which the secretions should be delicately removed by the use of a pledget of cotton upon a slender probe, and subsequently a local application of the persulphate of iron should be made—the whole manipulation, of course, is carried out by means of the head-mirror with reflected light. This is to be repeated at intervals of from two to four hours, according to the progress of the exudation.

If the membrane extends notwithstanding the effort to check it, the cavity soon becomes thoroughly occluded, and the manipulation above described is rendered impossible. In such cases, our main reliance will be upon the use of douches or sprays of a disinfecting character.

A diphtheritic exudation in the nose assumes always a somewhat effiorescent type, the membrane being very thick, and hence the passages soon become more or less completely occluded. In such a case, of course, atomized fluid cannot be made to reach to any depth. We are compelled, therefore, to resort to the syringe. If deftly managed, this instrument is attended with no special danger, and it enables us to medicate the parts more thoroughly than any other device. The ordinary ear-syringe answers an excellent purpose.

Statistics seem to show quite clearly and all authorities unite in the opinion, that the death-rate in nasal diphtheria has been notably diminished since the systematic irrigation of the parts invaded has been the general practice. This has resulted from the use of disinfectants rather than from any specific local applications, as in this manner the main danger of the disease, namely, septic infection, may be to an extent controlled. In this view a solution of corrosive sublimate, one part in five thousand, becomes our main reliance. The best position in which the patient can be placed for carrying out this manipulation is in the sitting posture, with the head bent well forward. If the heart's action is especially feeble, this position, of course, becomes objectionable. Hence we simply turn the child's head well over upon the edge of the pillow, in such a way that the face hangs downward, and then syringe into the upper nostril, allowing the fluid to escape through the lower. The nozzle of the syringe should be fitted well into the nostril, and the stream thrown slowly and gently into the cavity. If the parts are so completely occluded that a stream of water cannot be made to pass around from one nostril to the other, our dependence

will be upon the local application of the disinfecting fluid by means of a pledget of cotton wound upon a slender probe and gently passed into the cavity. This manipulation should be accomplished with great care, and with proper illumination by means of the concave mirror.

As before intimated, I believe that nasal diphtheria always results from the extension of the membrane from the naso-pharynx. When this latter cavity is involved, it is best medicated, probably, by means of a curved probe inserted through the oral cavity, using the solution of iron to arrest the exudative process and the bichloride solution for disinfecting purposes. In using the perchloride or persulphate of iron in the naso-pharynx, it is to be borne in mind that these parts are exceedingly sensitive; and it is well, in making this application, to dilute the officinal liquor with from two to four parts of glycerin, thus not only reducing the strength of the solution, but forming a thick and syrupy fluid, which is less apt to drop to the parts below.

Internal Medication.—The most important indication, probably, for the internal administration of remedies in an attack of diphtheria lies in sustaining the vital forces and counteracting as far as possible the blood-poisoning. Alcohol presents us with a remedy which is, perhaps, as nearly a specific against septic infection as any that we possess. This should be given as soon as there are any indications of systemic prostration, and in such form as will be best assimilated and in the least degree irritate the digestive tract. Preference, I think, should be given to the use of whiskey, unless some contra-indication exists in a relaxed condition of the bowels, when brandy should be administered. Milk affords us one of the best vehicles for disguising the disagreeable taste of the spirit, and also for making it tolerable to the stomach. If rejected in this form, lime-water may be added. In very young children, perhaps a better method would be in the use of cream diluted to a certain extent with water, thus securing both stimulation and nutrition. The amount to be administered will depend somewhat on the gravity of the constitutional symptoms and the degree of tolerance. It is to be borne in mind always that stimulants can be given in comparatively large amounts in cases of infectious disease. For a child five years of age, suffering from diphtheria, the administration of from six to eight ounces of whiskey daily would probably not be excessive, although this must be governed mainly by the general condition of the patient, as evidenced most clearly in the heart-action as shown by the pulse. The spirit should be administered at intervals of from two to three hours.

While our main reliance will be in some form of alcohol, its

stimulating action may be increased by the use of carbonate of ammonia, in small doses, frequently administered. Jacobi attaches a certain amount of importance to the stimulating action of musk. If the heart's action is weak, this tendency should be corrected by the administration of digitalis. If this is not well tolerated, convallaria or strophanthus may be resorted to. Digitalis and strophanthus in combination in many cases seem to give better results than where the drugs are administered singly. The use of the tincture of iron I regard as only second in importance and value to the administration of stimulants. This should be incorporated with glycerin in the proportion of one to eight, and should be given without dilution. To a child of five years of age, a half-teaspoonful dose may be given every two or three hours. In this manner we get both the local and constitutional action of the drug. In this syrupy form the drug is well diffused throughout the fauces during deglutition, and exerts its specific action upon the fibrinous exudation. Whether this drug exerts any influence upon the poisonous ptomaines in the blood can only be a matter of speculation. Judging from its well-known action in erysipelas, we may fairly draw the conclusion that it has some favorable action in diphtheria in this manner. Certainly it exerts a specific action on that blood condition which we call hyperinosis, under the influence of which fibrinous exudations develop on a mucous membrane. Tincture of iron, therefore, has certainly a twofold and probably a threefold action in diphtheria, and presents us with a remedy whose aid, I think, we can ill afford to neglect in the management of these cases.

In addition to the above, there are certain drugs which are supposed to possess definite and specific properties in the treatment of diphtheria. These are the preparations of mercury, turpentine, bromine, pilocarpine, ozone, helenine, benzoate of soda, sulphide of calcium, and chloral. The first three of these deserve a somewhat extended notice; the others have enjoyed in their day a certain ephemeral reputation, but have fallen into disuse. It is doubtful if they exert any influence whatever for good upon the disease.

The mercurial treatment of the disease, as advocated by Reiter[1] in the form of calomel, by Billoti,[2] Pepper,[3] and Massei[4] in the form of the bichloride, and by Rothe[5] in the form of the cyanide, con-

[1] Philadelphia Medical Times, 1878, vol. viii., p. 145.

[2] Morgagni, 1876, vol. xviii., p. 616.

[3] Transactions of the American Med. Ass'n, 1881.

[4] Deutsche med. Zeit., 1887, No. 17.

[5] Deutsche med. Woch., 1881, vol. vii., p. 467; and Allg. med. Cent.-Zeit., 1880, p. 1,081.

sists in the administration of the drug in large and frequently repeated doses from the very onset of the attack, thus bringing the patient completely under its influence as quickly as possible. Without entering upon a discussion as to the action of the drug as claimed by its advocates, it is sufficient to say that it is regarded as a specific in exercising a direct control upon the progress of the disease.

I quite agree with Jacobi[1] in the view that mercury is not to be regarded as a specific in diphtheria. That it exerts a favorable influence on certain features of the disease, I fully believe. The bichloride seems to have the larger number of advocates. This is probably due to the well-known action of this drug upon disease germs. I am disposed, however, to doubt whether the mercurial treatment has any influence upon this feature of diphtheria, but, on the contrary, am of opinion that its action is mainly in controlling the fibrinous processes. Its action, therefore, in a case of diphtheria from this point of view is not upon the blood poison, but upon the tendency to membrane formation in the fauces and especially in the larynx and trachea. Jacobi[2] makes the still further point that the separation of the false membrane in the trachea and bronchi is promoted by the use of the drug. For this direct action, therefore, upon the pseudo-membrane I think that we possess in some of the forms of mercury a remedy of undoubted therapeutic value, and one which, in no small proportion of cases, probably, will lend us material aid in combating a fatal tendency in this disease. The especial form to be administered, I think, is to be governed mainly by the question of tolerance. In this point of view we will probably get the best results from the administration of either calomel or the hydrargyrum cum creta in the full physiological dose, repeated every two hours for the first twenty-four hours, and subsequently at longer intervals, according to symptoms.

Turpentine is another remedy which is supposed to have a definite specific action on the disease. It was first advocated by Vosse,[3] and subsequently indorsed by Satlow,[4] Roese,[5] Baruch,[6] and others. It is used for its germicide action, and is given either in frequently repeated doses through the day, or in a single dose. It may be given suspended in milk in the form of emulsion, or pure. In this latter form it exerts a local action on the morbid process in the fauces, and, subsequently being absorbed into the blood, is

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[1] Op. cit., p. 188. [2] Loc. cit.

[3] Berl. klin. Woch., 1880, p. 612.

[4] Jahrbuch für Kinderheilkunde, 1883, p. 53.

[5] Therapeut. Monatsheft, Oct., 1887.

[6] New York Medical Record, 1887, vol. xxxii., p. 784.

eliminated through all the mucous membranes, thus exerting its germicide action throughout the whole system. It is claimed by the advocates of this method that the drug is easily tolerated, and may be given in as large an amount as a fluid ounce in a single dose, to a child ten years of age, without bad effect. That the remedy is one of value cannot be questioned, in view of the notable results which its advocates record. Thus, Lunin[1] reports 12 cases of what he designates as the fibrinous form of diphtheria treated with this drug with but a single death, while Baruch reports 39 cases with but two deaths.

The bromine treatment consists of the internal administration of the drug in connection with its local application to the membrane in the fauces. The preparation ordinarily used is the Lawrence Smith solution, which is prepared as follows: To two ounces of the saturated solution of bromide of potassium an ounce of bromine is slowly added, with repeated shaking, after which an ounce of water is added, thus forming a solution of bromine of the strength of one to four. Of this from six to twelve drops is administered in a tablespoonful of sweetened water at intervals of from one to three hours. It is a highly diffusible drug, and probably penetrates the system extensively. Its action is to destroy the activity and virulence of the specific germ. Thompson[2] has found such excellent results from the use of this drug that he reports having used it for eighteen years, to the exclusion of all other remedies. The failure of other observers to obtain equally favorable results must be accounted for by a lack of thoroughness and detail in the administration of the remedy; for if we base our judgment on the results of treatment as recorded in medical literature, we must regard the bromine treatment as secondary in efficacy to either the turpentine or mercurial methods.

General tonics may be occasionally indicated, but when we consider the number of drugs of unquestioned value which we are called upon to administer, in most cases probably it would seem unwise to endanger the tolerance of the digestive tract by increasing the number of remedies. If any drug is used for its tonic effect, preference will undoubtedly be given to quinine. This is best administered in the form of a suppository, not at regular intervals, but as indications present.

Chlorate of potash is frequently incorporated with the iron preparations for some supposed action that it exerts upon the local process in the fauces, but more especially perhaps for its oxygenating powers. The deleterious action of this drug on the kidneys should always be kept in view. When we consider the uncertainty

[1] Loc. cit.

[2] Loc. cit.

of its action, it would probably be better omitted in most cases for internal administration, although as a mouth-wash or gargle it may be used for cleansing and disinfecting purposes.

Inhalations.—Inhalations of various kinds have always played a more or less prominent part in the management of all grave inflammatory affections in the throat. How important a part they play is perhaps open to some question. The instrument in common use is the ordinary steam atomizer, which not only generates steam, but also atomizes certain medicated fluids, which are to be inhaled by the patient. The drugs used in this manner are: creasote, carbolic acid, eucalyptus, pinus canadensis, thymol, corrosive sublimate, and various other antiseptic and astringent agents. There can be no question that the comfort of a patient suffering from diphtheria is notably promoted by keeping the atmosphere of the sick room thoroughly charged with moisture. That the drugs atomized by the steam atomizer possess any notable effect as regards the faucial disorder is very doubtful. It is perhaps not safe to question the propriety of diffusing some disinfectant through the sick-room by means of the atomizer, such as carbolic acid or eucalyptus. Even here, however, if there be disease-germs floating in the atmosphere, it is not to be hoped that these will all be destroyed by means of the minute amount of the disinfectant which is thus diffused. As we have seen before, the observations of Osler teach us that as long as the specific germ of diphtheria is kept in a moist state it is practically imprisoned and does not permeate the atmosphere. The diffusion of steam through the room, therefore, undoubtedly has a tendency to control the dissemination of the germ. The beneficial action of the atomizer lies here perhaps rather than in disinfecting the sick-chamber.

Another use of the inhalations consists in directing the stream directly upon the fauces of the patient, from whence it is carried into the air passages below by the respiratory act. In this way disinfecting agents may be brought more directly in contact with the diseased process, but even here their influence for good must be regarded as comparatively feeble. If any benefit is accomplished, it must be attributed largely to the steam alone, which has a tendency to soothe the parts and reduce swelling. If a membrane has formed, it undoubtedly to a certain extent promotes its exfoliation. This is especially true if the membrane has developed in the larynx and trachea, the steam inhalations keeping the parts soft and moistened and controlling extension to such a degree as that a small amount of additional patency is secured to the air-passages, whereby respiration may be maintained for a longer time than would otherwise be possible. Inhalations from

lime have for a long time enjoyed a well-deserved reputation for use in cases where the membrane has developed in the larynx, the method consisting in throwing unslaked lime into water, the slaking process developing steam, which rises in dense volumes and is conveyed to the patient by means of a suitably constructed tent or cone. The theory is that the steam as it arises carries small particles of lime with it, and that these have a beneficial action upon the false membane. In just what way this benefit accrues it is difficult to state. Clinical obseravtion, however, shows beyond much question that its use is of value. Practically, then, I should consider the benefit obtained from inhalations from slaked lime as greater than those obtained from the various disinfectants and astringents above enumerated as used in the steam atomizer.

Sprays.—The hand-ball atomizer affords a simple and convenient instrument for applying medicated solutions directly to the morbid process in the fauces. I know of no applications made in this way which in any degree modify the severity of the inflammatory process or control fibrinous exudation. The practical value of these applications is probably entirely limited to the use of antiseptic agents; and for this purpose, in the order of preference, there may be applied bichloride of mercury, 1 in 5,000; phenol, 1 in 200; boric acid, 1 in 20; thymol, 1 in 1,000; oil of eucalyptus, 1 in 1,000, and peroxide of hydrogen. These solutions cannot be expected to penetrate the parts sufficiently to exert any controlling influence upon the morbid process in the deeper tissues; the most that can be expected from their use is in disinfecting the false membrane and the secretions, both in the fauces and the mouth.

Tracheotomy and Intubation.—In a large proportion of cases, as we have seen, despite all efforts at arresting the disease, the false membrane develops in the larynx and the parts below, giving rise to suffocative symptoms. This extension of the exudation is accaccompanied usually by a rise of temperature of from one to two and a half degrees, as shown by the thermometer. This symptom, however, is not one of any marked clinical value, in that the dyspnœic symptoms manifest themselves by subjective appearances which only too clearly indicate the setting in of this most grave of complications. Laryngeal invasion is first evidenced by more or less complete loss of voice. This is followed in the course of a few hours, or at the latest on the second day, by stridulous breathing, the laryngeal stenosis giving rise to both inspiratory and expiratory dyspnœa, the former of course being more marked. The loss of voice may be due to the deposit of the membrane directly upon the vocal cords, interfering with their vibration, or their approximation may be hampered by a subglottic deposit.

The further progress of this complication is shown practically by the increased dyspnœic symptoms, and also by the setting in of more or less well-marked cyanosis. The primary effect of the laryngeal dyspnœa is to interfere with the proper oxygenation of the blood, thus constituting an additional menace to the vital powers, already depressed by the presence in the blood of the specific poison.

A still further danger which the laryngeal obstruction entails is in the development of capillary bronchitis, œdema of the lungs, or lobular pneumonia. Whether these latter affections are directly traceable to the laryngeal stenosis is questioned by many. This however, has been sufficiently discussed in a previous chapter; we content ourselves here with the assertion that the integrity of the deeper tissues of the lungs is seriously menaced by the existence of any laryngeal or tracheal stenosis. When this occurs in diphtheria, the danger is to be regarded as even more imminent.

The measures already enumerated for the arrest of the disease failing, our only remaining resource practically consists either in opening the air passages or the insertion of an intra-laryngeal tube. The choice of these measures will depend somewhat upon the personal preferences and experience of the physician in attendance. The question as to which offers the best hope of either temporary or permanent relief to the patient is perhaps better left to the full discussion of the subject which will be given in the section on intubation.

Regarding the question as to when operative interference shall be resorted to, no definite directions perhaps can be given, further than to say that interference must be regarded as imperative in those cases in which, other remedies failing, the laryngeal disease is progressive, as shown by the increase of the dyspnœic symptoms. It is scarcely necessary to emphasize the point that very grave dangers are incurred by delaying operation, as the teaching of clinical experience in this direction is almost universal that a larger proportion of cases are saved by an early tracheotomy or intubation than where these measures are resorted to after the vital forces have been notably depressed, not only by the persistence of the blood-poisoning, but by the defective oxygenation which the laryngeal process entails. The relief of dyspnœa, whether by intubation or tracheotomy, of course exerts no direct influence upon the extension of the membrane; and after an operation, as we know, a majority of patients succumb to asphyxia, a stenosis subsequently developing from the pseudo-membranous deposit in the trachea and bronchi. Notwithstanding this, immense relief is afforded in most cases by the operation, and a fatal issue postponed. When

we consider, therefore, the simplicity of the measure and the slight danger to life which can be directly attributed to the operation itself, there should be no question as to the propriety of resorting to it early in any given case of laryngeal invasion. This applies equally to intubation and tracheotomy, but especially to the former. The details of these operations are discussed in another place.

Hygienic Management of the Sick-Room.—The arrangement of the sick-chamber in a case of diphtheria should be based on our knowledge that the specific germ possesses great vitality, and is usually disseminated by transmission through the air, or is carried in the clothing, in the hair, or practically by any vehicle which will afford it a sufficiently permanent lodgment. Still further, it is to be borne in mind that the source of the contagion in any given case is in the morbid process in the fauces of the patient. In this region it is practically imprisoned by the moisture of the parts, but is expelled in the fluids which make their exit from the mouth and nose, and probably in the fæces; after it loses its moisture, it easily floats through the atmosphere. In this view of the case, we have to deal with an infectious germ, whose action we know fairly well, and whose dissemination we ought to be able to prevent with a fair degree of success.

All individuals who are in any degree susceptible to the disease, especially young children, of course should be removed from all possible source of contagion. The attendance upon the patient should be limited, and all intercourse between such attendants and other individuals in the house should be forbidden as far a possible. All rugs, hangings, and upholstered furniture should be removed from the room, the dress of the attendants should be restricted to cotton and linen, and the bedding of the patient should be limited as much as possible to linen or cotton sheets and woolen blankets.

It is the common practice to spray through the room at frequent intervals solutions of carbolic acid, thymol, chloride of zinc, and other germicides, and at the same time place dishes about the room containing disinfectants in solution. I think it somewhat doubtful if these measures accomplish any special good. A solution of corrosive sublimate of the strength of 1 to 5,000 possesses unquestionably germicidal powers, and if we should spray this about the room at frequent intervals it might be of service; and yet it must be borne in mind that we are using a somewhat powerful remedy here, and unexpected accidents might occur. The judicious use of this solution in the atmosphere is to be commended.

Unquestionably the most important and efficient method of controlling the dissemination of the micro-organism consists in the thor-

ough disinfection of every article which can possibly convey the germ from the body of the patient. This, I think, is quite feasible, and can be done with considerable degree of certainty. A vessel containing a solution of corrosive sublimate, 1 to 1,000, should be kept readily at hand, into which the patient should expel all the saliva or sputa that escapes from the mouth. Every handkerchief, sponge or towel which is used about the face of the patient should be immediately thrown into such a solution, as well as any clothing removed from the body. The vessel that is used for fecal evacuation should also contain an abundant supply of the disinfectant fluid. The hands and face of the patient, as well as those of the attendants, should be disinfected in the same manner. In this way every possible avenue by which the germ can be conveyed from the body is watched with the greatest care, and wherever there may be a suspicion of its existence its vitality should be destroyed by the mercurial solution.

These measures become doubly important when we consider that in every case of diphtheria there exists a certain danger of reinfection of the patient during convalescence, by inhaling germs which have developed in his own fauces during the progress of an attack of the disease, and which, having lodged in some portion of the sick-chamber, have preserved their vitality during the intervening period. A number of clinical observations have been reported which establish this view. These cases still further teach us the fact that one attack of diphtheria does not afford immunity from a second.

The further hygienic measures which should be observed consist in keeping the room at a temperature of about sixty-eight degrees, and having the atmosphere fully surcharged with moisture by means of the steam apparatus already alluded to. It is a somewhat prevalent idea that fresh air involves a certain danger during an inflammatory affection of the air passages. This of course is an error, as proper ventilation is one of the first of hygienic laws in the sick-room. This is of especial importance in diphtheria, not only for its direct influence upon the patient, but also as allowing an exit into the outer air of such disease germs as may have escaped the disinfectant precautions which have been resorted to.

After convalescence is fully established, the patient is removed from the room, and all sheets, blankets, pillow cases, and other material of this kind are thoroughly disinfected by the mercurial solution, and the room itself, with the mattresses, etc., fumigated by burning sulphur. As is well known, the presence of a certain amount of moisture in the room adds notably to the efficiency of the sulphur fumes; therefore in connection with the burning sul-

phur, steam also should be generated in the room, which is to be tightly closed to prevent the escape of the fumes.

SEQUELÆ.—The most common of all the *sequelæ* which result from an attack of diphtheria are paralyses involving certain muscles or sets of muscles scattered throughout the body. As a matter of clinical observation, the muscles of the palate are affected far more frequently than any others, with the exception of the ciliary muscle of the eye. The frequent involvement of the palatal muscles led to the view that this was due to their contiguity to the inflammatory process in the fauces, the contractility of the muscular tissue being abolished by an extension of the morbid action. The fact that the ciliary muscle is a more frequent seat of diphtheritic paralysis than the palatal would seem to indicate the error of this view. The investigations of Charcot and Vulpian,[1] Leyden,[2] Roger, Buhl,[4] and others have shown that the paralysis is the direct result of a neuritis involving either the terminal filaments, the trunk of the nerve, or the ganglionic cells of the spinal cord. This neuritis, moreover, is set up by the action of the poisonous ptomaines in the blood.

In the order of frequency, the paralytic *sequelæ* of diphtheria occur in the ciliary muscle of the eye, the palatal muscles, the motor muscles of the eye, the muscles of the lower extremities, the muscles of the upper extremities, the muscles of the trunk, and the sphincters. The loss of tendon reflex, already alluded to, is also perhaps to be classed among the paralyses. These paralyses may develop as early as the third day of the attack, or may be postponed until convalescence is established, and in rare instances may be delayed for some days after. The extent and duration of the paralysis bears no relation whatever to the severity of the diphtheritic attack, as a severe and prolonged paralysis may follow an exceedingly mild type of the disease.

Paralysis of the ciliary muscle results in defective vision from lack of accommodation. It may start on one side, but sooner or later in all cases involves both eyes. It is easily overlooked in young children, more especially if they are myopic.

Paralysis of the palate gives rise to a certain amount of difficulty in deglutition, but more markedly affects the tone of the voice and articulate speech. The phonative waves make their way unimpeded into the nasal cavity, increasing the nasal tones of the voice, while at the same time the articulation of those sounds which

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[1] Compt. rendu de la Soc. de Biol., 1862.

[2] Charité Annalen, 1878 (Berlin, 1880), vol. v., p. 206.

[3] Arch. gén. de Méd., 1862, 5th series, vol. xix., p. 5.

[4] Zeitschr. für Biol., 1867, p. 359.

depend upon the movements of the palate, viz., the vowel sounds and the gutturals, is markedly hampered. In connection with the palatal paralysis, the pharyngeal muscles are occasionally involved, in which case deglutition is much more seriously interfered with. In simple palatal paralysis there is a liability to the passage of fluids, and in a lesser degree of solids, into the naso-pharynx during this act.

Paralysis of the motor muscles of the eye may involve any or all of these, but as a rule confines itself to either the external or internal recti, usually of both eyes, giving rise to either a convergent or divergent strabismus. This form of paralysis usually occurs in connection with paralysis of the ciliary muscle, the latter occurring first as a rule, and the recti muscles becoming involved as the result in no small degree of the straining of these muscles in the effort at accommodation.

Paralysis of the lower extremities gives rise either to a difficulty in locomotion or complete inability to use the limbs. As a rule, diphtheritic paralysis is confined to the motor nerves, although the sensory nerves are occasionally involved. When this is present in the lower extremities, these symptoms may assume the ataxic type.

If the upper extremities are involved, it simply leads to enfeeblement of the muscles of the arms.

Paralysis of the chest muscles usually confines itself to the intercostals, although instances of paralysis of the diaphragm have been reported. It gives rise to difficulty in respiration, and may simulate an attack of bronchitis, the mucus accumulating in the air passages, and the patient being unable to expel it on account of the muscular weakness. In a somewhat curious case of this kind reported by Irvine,[1] the observer was of the opinion that in connection with the paralysis of the chest muscles there was also paralysis of the bronchial muscles, basing his view on the very large accumulation of mucus in the tubes, which the child, a girl of six, was unable to expel.

Paralysis of the sphincters is an exceedingly rare *sequela* of diphtheria, and gives rise simply to either difficulty or complete inability in retaining the fæces and urine.

As a rule, diphtheritic paralysis is not considered a very grave complication of the disease, and does not entail any very serious danger, except in those cases in which the respiratory apparatus is involved, in which, as we have seen, there may arise a troublesome bronchitis.

Cases of paralysis of the diaphragm have been reported which terminated fatally.

[1] Trans. Clin. Soc. London, vol. ix., p. 188.

The affection tends to get well of itself, in periods varying from three to six weeks, although undoubtedly the recovery is hastened by the administration of general tonics, such as barks and iron, with the addition of strychnia in appropriate doses. If the paralysis is persistent, the direct application to the weakened muscle of the continuous current of electricity will be found of material assistance, unless a better reaction is obtained from the faradic.

Intubation and Tracheotomy.

When it becomes necessary to give relief to increasing dyspnœic symptoms which threaten suffocation, we have two resources, intubation or tracheotomy. The considerations which weigh in favor of intubation are: the simplicity of its performance, the avoidance of a cutting operation, and the retention of a larger portion of the normal respiratory tract for breathing purposes. The objections to intubation are: the narrowness of the tube, the danger of its becoming occluded by the excessive secretions, the difficulty of retaining it *in situ*, and the fact that, impinging upon the mucous membrane in a state of diphtheritic inflammation, it is liable to cause erosions whereby a more open avenue is established for the entrance of disease germs into the blood.

The considerations which would seem to favor tracheotomy are that the air passages are open at a point farther distant from the primary exudation, and therefore in a situation less liable to be invaded, and that, the trachea being opened, easier access is obtained for local medication in case the false membrane extend to this region. As against tracheotomy there is the surgical operation with the administration of an anæsthetic, and the entrance of air directly into the trachea with the practical abolition of the important portion of the respiratory apparatus above, thus entailing an additional danger of the supervention of bronchitis and perhaps pneumonia.

Without discussing at length these various considerations, their comparative value can only be practically established by reference to the results obtained by resort to the different methods of procedure.

In a very thorough review of the subject, Stern[1] institutes a comparison of the results which have been obtained respectively from tracheotomy and intubation. From French sources, mainly derived from the statistics of Cohen[2] and Sanne,[3] he finds that 5,151 tracheotomies have been performed, with 1,306 recoveries,

[1] Trans. Ninth Internat. Congress, vol. iv., p. 89.
[2] "Croup," Phila., 1874. [3] "Diphtheria," St. Louis, 1887, p. 467.

or 24.6 per cent. From Portuguese sources he collated 59 tracheotomies, with 21 recoveries, or 35.5 per cent. In Germany there were 1,837 operations, with 558 recoveries, or 30.4 per cent. In England there were 333 tracheotomies, with 97 successful cases, or 29.2 per cent. Masten,[1] in America, has collated 860 operations, with 195 successful cases, or 22.7 per cent. Agnew[2] reports 11,696 cases, with 3,070 recoveries, or 26.25 per cent; while Monti[3] reports 12,736 cases, with 3,409 recoveries, or 26.8 per cent. Lovett and Monroe[4] record 21,853 operations, with 6,135 recoveries, or 28 per cent. Of course these latter statistics are probably drawn in the main from the same sources, and yet grouping them all together will not vitiate the conclusion, which shows that in 54,665 cases of tracheotomy collated from all sources there have been 14,839 recoveries, or 27.14 per cent. On the other hand, Stern[5] has collated 957 cases of intubation by 75 different operators, in which there were 252 recoveries,or 26.4 per cent. Waxham[6] has collated, largely from the same sources, 1,007 cases, with 269 recoveries, or 26.71 per cent, the number of operators being but 69. Dillon Brown[7] has collated 2,372 intubations up to November, 1888, with 646 recoveries, or 27.2 per cent. We thus find that practically the percentage of recoveries in the two operations is about the same; in tracheotomy it being 27.14 per cent, while in intubation it is 27.2 per cent, taking the latest statistics, viz., those of Brown. The difference in favor of intubation is thus about one-sixteenth of 1 per cent. This is certainly a most curious result of statistical investigation. Such a very minute difference in favor of intubation would necessarily carry little weight; our judgment in a given case must therefore be based on other considerations.

Waxham sums up admirably the advantages and disadvantages of intubation as follows: Among its disadvantages are the difficulty of inserting the tube; the danger of injuring the soft parts from lack of skill in operating; the difficulty of extracting the tube, which it is generally conceded requires more skill than its introduction; the danger of pushing down the membrane below the tube, thus occluding it; and, finally, the difficulty of swallowing while the tube is *in situ*, and the consequent danger of pneumonia from the entrance of food and fluid into the lungs. This latter danger he regards as overestimated, in that by the judicious selection of the tube, and the most watchful care and management of the case, it may be avoided.

[1] "Annals of Anat. and Surgery," Brooklyn, 1881, vol. iii.
[2] "System of Surgery," 1878, vol. iii. [3] "Annals. of Surgery," vol. i., p. 581.
[4] Amer. Jour. Med. Sciences, July, 1887. [5] Loc. cit.
[6] Trans. Ninth Internat. Med. Congress, vol. iii., p. 527.
[7] "Diphtheria and Croup," Billington and O'Dwyer, New York, 1889, p. 297.

The advantages of intubation, on the other hand, are as follows: It can be performed by an expert quickly and almost instantly; there is no loss of blood; there is no injury to the soft tissues; there is little or no pain; there is no shock from the operation; there is no danger from septicæmia or erysipelas, as from an open wound; there is much less danger from the tube than from a tracheotomy tube; there is no open wound to heal by slow granulation; the air enters the lungs through the natural passages, is warm and moist, and there is consequently no drying of mucus in the tube; recovery is rapid after removal of the tube; less skill and attention is required in the after-treatment than after tracheotomy; the consent of parents is much more easily obtained, and thus many patients are saved where the graver operation would not be allowed; and, finally, as large a proportion of cases at all ages can be saved as by tracheotomy, and a much greater proportion can be saved among children less than three years of age. This latter point has been admirably brought out by Stern,[1] who in an analysis of 519 cases of intubation with reference to age finds that there were under two years 110 cases, with 17 recoveries, or 15.5 per cent; between two and two and a half years, 53 cases, with 13 recoveries or 24.5 per cent; between two and a half and three and a half, 135 cases with 39 recoveries, or 28.9 per cent; between three and a half and four and a half years, 86 cases, with 29 recoveries, or 33.7 per cent; between four and a half and five and a half years there were 60 cases and 17 recoveries, or 28.3 per cent; and over five and a half years, 75 cases, with 28 recoveries, or 37.3 per cent.

Bourdillat,[2] in an analysis of 1,300 cases of tracheotomy, found that the percentage of recoveries under two was 3 per cent; at two, 12 per cent; between two and a half and three, 17 per cent; between three and a half and four, 30 per cent; between four and a half and five, 35 per cent; beween five and a half and six, 38 per cent; and above six, 41 per cent.

Comparing these statistics, we find, then, that intubation performed on children under two years of age gives us a gain of 12.5 per cent; between two and two and a half there is a gain of 12.5 per cent; between two and a half and three and a half there is a gain of 11.9 per cent; between three and a half and four and a half there is a gain of 3.7 per cent; between four and a half and five and a half, a loss of 6.7 per cent; and over five and a half there is a loss of 2.2 per cent.

The advantage in favor of intubation in children under five years of age seems clearly established. The youngest case of recovery in intubation was at six months, while the eldest which has

[1] Loc. cit. [2] Bull. de la Soc. méd. des Hôp., Paris, 1867, p. 39.

been reported was fourteen years. It seems to be the clearest teaching of statistics that intubation promises the best results in children under four years of age; between four and five a decision should be based mainly on the consent of the parents, the surroundings of the child, and other considerations. After the age of five, tracheotomy promises a better hope of saving the patient.

If there is any indication that the exudation has invaded the trachea and air passages below, intubation affords even less hope of relief than tracheotomy. Stern makes the point that intubation should be practised in all cases where the skill and discretion of the attendants cannot be depended upon to meet emergencies. I am disposed to think that in such cases a patient is safer from accident with a tracheotomy tube properly inserted than with an intra-laryngeal tube.

Turney[1] reports a number of cases which he observed of accidents after intubation, which could only be overcome by the immediate presence of a skilled attendant, such as the blocking up of the lower end of the tube, and the expulsion of the tube. He suggests, therefore, the propriety of first inserting an intralaryngeal tube; but if at the end of two days dyspnœa still persists, he would perform tracheotomy.

It is a somewhat common assertion that intubation, being such a comparatively simple procedure, is resorted to in a great many cases which would have recovered even without any interference, and that in this manner the percentage of recoveries is increased. It is to be borne in mind that intubation is undoubtedly permitted in a much larger proportion of cases of pseudo-membranous disease of the larynx than tracheotomy, and unquestionably in this manner many patients survive the disease who otherwise would have succumbed. On the other hand, as O'Dwyer[2] states, intubation has been performed in a large number of cases simply to relieve dyspnœa and without hope of saving life, as in diphtheritic patients suffering from pulmonary complications; nevertheless, these cases figure on the unfavorable side of the comparative statistics. The value of intubation therefore is not to be estimated, purely, I think, by a statistical comparison of its results with those of tracheotomy. In very many cases of pseudo-membranous disease of the larynx, the dread of surgical interference prevents parents from giving consent to tracheotomy, whereas intubation rarely, if ever, meets with objection. Moreover, when tracheotomy is permitted it is not infrequently delayed until it offers but a faint hope of success. I deem it therefore but a fair inference that the number

[1] St. Thomas' Hosp. Reports, vol. xix., p. 85.

[2] Trans. Ninth Internat. Med. Congress, 1887, vol. iii., p. 540.

of lives which have been saved by the introduction of this method by O'Dwyer is far greater than is suggested by a comparative study of the statistics of intubation and tracheotomy.

The Operation.—The idea of inserting a tube for the relief of dyspnœa dates back to the time of Hippocrates,[1] who advised in such cases that a pipe should be introduced into the throat to admit air into the lungs. The procedure, however, seems never to have been resorted to until Chaussier in 1780 proposed the insertion of flexible tubes into the larynx in cases of threatened suffocation, the practicability of which was subsequently demonstrated by Desault. This resort never came into general use, although occasionally advocated in literature by such observers as Finaz,[2] Ducasse, Dieffenbach, Lallemand,[3] Bénoit,[4] and others. The method consisted simply in the insertion of a flexible tube into the larynx, either through the nose or the mouth, but it does not seem to have been attended with any notable success. Bouchut,[5] finally conceived the idea of fashioning a tube to fit the interior of the larynx, and which should remain *in situ*. His instrument consisted of a small tapering cylindrical tube of silver, five-sixths of an inch long and a quarter of an inch in diameter; its upper extremity was fitted with a collar, immediately below which was a slight expansion or flange. A perforation in the collar afforded an attachment for a cord, which was used to prevent the instrument slipping into the trachea. The tube was to be retained *in situ* by the vocal cord falling between the collar at its upper extremity and the flange immediately below it. The instrument was inserted by means of an obturator. The fore-finger of the left hand, protected by a proper shield, was passed into the fauces and the epiglottis held back, after which the tube, guided by the left fore-finger in position, was carried into the larynx. Bouchut's procedure having been condemned by a committee of the Academy of Medicine appointed to investigate it, intubation fell into oblivion until 1880, when Dr. Joseph O'Dwyer, of New York, working independently, commenced to experiment with this method. Too much praise cannot be accorded to the genius and perseverance of Dr. O'Dwyer, who continued his experiments through a period of five years before making public his method. During this time he had so far perfected the tube itself, as well as the technique of the operation, that upon publication the procedure was immediately received with the greatest favor, and extensive resort had to it in cases of

[1] "De Morbis," lib. iii., cap. x.
[2] Thèse de Paris, 1813.
[3] Jour. de la Soc. méd. prat. de Montpellier, 1844.
[4] Ibid. [5] Gaz. des Hôp., 1858, p. 442.

croup and diphtheria, not only in this country, but throughout the world.

It seems to me no small compliment to the originator of the operation that, in the very large number of cases in which it has been used since he first published his paper, it has not been found wise to modify, except in a very slight degree, either the instrument or the manipulation which he recommended in his original publication.

A complete set of O'Dwyer's instruments for children consists of, *first*, six tubes of different sizes, and varying from one and a half to two and a half inches in length; *second*, an introducer; *third*, an extractor; *fourth*, a mouth gag, and *fifth*, a scale.

The tube is an ovoid cylinder, bulging at its centre, and is fitted with a rounded head at its upper extremity, which lies upon the ventricular bands when *in situ*, thus preventing the instrument

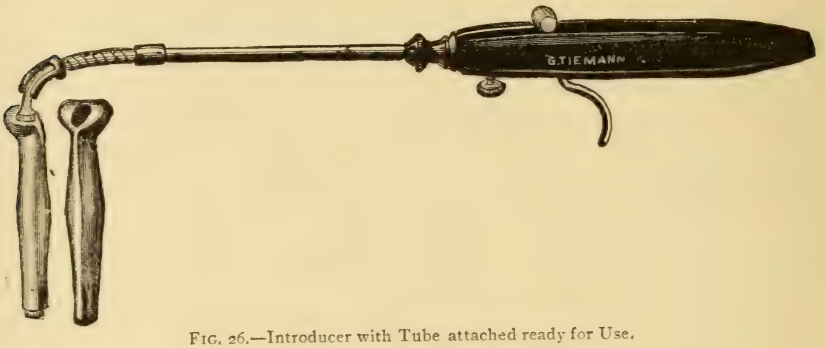

FIG. 26.—Introducer with Tube attached ready for Use.

from falling into the trachea. The anterior angle of the head is perforated for the insertion of a cord, whose use is for the prompt recovery of the instrument in case of failure to properly insert it in the larynx, the blocking of the tube by detached membrane, or other accident.

The introducer (see Fig. 26) consists of a long slender rod fitted with a handle. Outside of the rod is a sliding tube, operated by the button seen on the upper surface of the handle. The distal extremity of the introducer is a long jointed rod, curved to a right angle with the shaft, which passes completely through the intralaryngeal tube. That portion of the introducer which fits into the laryngeal tube is jointed in such a way as to facilitate its withdrawal. The object of the sliding portion of the introducer is to detach the laryngeal tube after it has been placed in the larynx.

The extractor (see Fig. 27) is an instrument devised for withdrawing the tube when desired; its action will be easily understood

by the figure. It is constructed on the principle of the curved forceps, with the exception that the small blades seen at its distal extremity are in apposition. When this instrument is inserted into the upper end of the laryngeal tube, the small blades are opened by pressing on the lever, thus enabling the operator to withdraw the

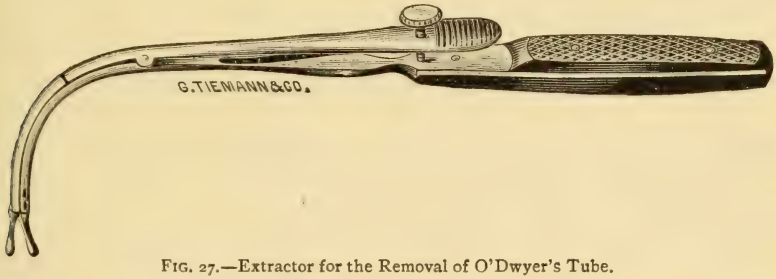

FIG. 27.—Extractor for the Removal of O'Dwyer's Tube.

tube. The small set screw in the handle of the lever is to regulate the extent to which the blades are opened, especially with reference to the avoidance of injury to the surrounding parts in case the instrument is inserted outside of the tube.

The mouth gag recommended by O'Dwyer is the Denhardt instrument (see Fig. 28), the handles of which are bent back in such a manner as to hamper the manipulation in the least degree.

The scale (see Fig. 29), has been arranged by O'Dwyer to show the size of tube best fitted for the different ages: thus, a tube reaching from the lower end of the scale to No. 1 is the size adapted for children a year old; to No. 2, for children two years old, etc.

Method of Operating.—The child should be placed in a sitting position on the lap of an attendant, with the head resting firmly against the shoulder, the hands being held, or firmly secured by a binder passed around the body; the gag is then inserted into the left side of the child's mouth as far back as feasible; an assistant stands immediately behind the child, holding its head firmly, and slightly elevating the face. The operator standing immediately in front of the patient, with the introducer held lightly in his right hand, passes his left forefinger into the fauces and searches for the

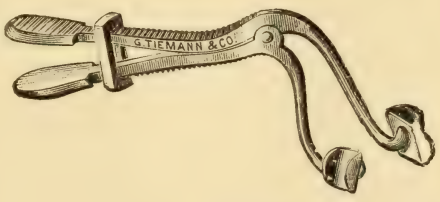

FIG. 28.—Mouth Gag.

FIG. 29.—The Scale.

epiglottis, and, failing this, the cavity of the larynx. As soon as he is convinced that the tip of the forefinger is beyond the epiglottis and immediately over the cavity of the larynx, the handle of the introducer is brought down upon the chest of the child, while the tube is passed back into the fauces along the side of the left index finger, acting as a guide. The handle of the introducer is then elevated, and at the same time the distal extremity of the tube carried backward along the index finger until it is immediately over the laryngeal entrance, when it is directed downward and carried quickly into position, the successful introduction of the tube being ascertained by the left index finger. As soon as the tube is *in situ*, it is detached from the introducer by pushing forward the sliding tube by means of the button on the upper surface of the handle, the manipulation being aided by the firmer grasp of the instrument, which is secured by the index finger on the small trigger which is seen on the lower side of the handle of the introducer.

In withdrawing the instrument, the joint in that portion of the distal extremity of the introducer which fits into the tube enables the operator to extract it in an almost a direct line, thus avoiding the awkwardness of manipulation which would otherwise be necessary. During the removal of the obturator it is necessary to keep the index finger of the left hand on the shoulder of the laryngeal tube, to prevent its withdrawal with the obturator, and also to assist in the removal of the cord which has been attached to its rim. This, of course, should not be done until the success of the operation is demonstrated in the relief of dyspnœic symptoms.

When we consider that this operation is done for the relief of one of the gravest and most distressing conditions which the physician is called upon to meet, and, furthermore, that in many cases the child is struggling and choking from imminent asphyxia, it is easy to appreciate how absolutely necessary for the success of the manipulation are great manual dexterity and perfect self-control. Each successive step in the procedure must follow promptly and without the slightest hesitation, and no time is to be wasted in searching for anatomical regions. The whole procedure should probably not occupy over from five to eight seconds, and if the first attempt fails, it is better to give the patient an interval of rest rather than to prolong the effort beyond this period.

It would be exceedingly unwise for any one to attempt the insertion of a laryngeal tube who has not had special experience in laryngeal manipulation. This is only possessed by those who have had much to do with throat diseases. Failing this, it is probable that sufficient skill can be acquired, as O'Dwyer advises, by practising the operation on the cadaver. The operation is not always

unattended with accidents, such as the detachment of the membrane below the tube, whereby its calibre is occluded, the insertion of the tube into the œsophagus, and the laceration of the soft parts. The first of these accidents is one that cannot always be avoided; its occurrence is immediately recognized, and necessitates the prompt withdrawal of the instrument, and in most instances the subsequent performance of tracheotomy. The insertion of the tube into the œsophagus may very easily occur from the failure to elevate the handle of the introducer to a sufficient extent as to bring forward the distal extremity of the tube. Such an accident may be suspected if the tube passes down beyond the reach of the left index finger in the fauces, and, further, by failure to relieve dyspnœa. It is not an accident of any gravity, and simply demands a renewed attempt. Injury to the soft parts should only occur from rude and unskilful manipulation, and is scarcely a justifiable accident, as the operator should always be assured of the position of his instrument at each stage of the manipulation. The accidents which may occur when the tube is *in situ* are its occlusion by secretion or detached membrane, ulceration of the soft parts, its expulsion during the act of coughing, interference with deglutition, and the entrance of food into the air passages during this act. If the tube becomes occluded from any cause, it must be removed, cleansed, and reinserted. In case of failure to relieve the symptoms in this way, tracheotomy is the only further resort. Ulceration of the soft parts is the result of pressure from the collar of the tube, and also of pressure on the trachea by its lower extremity. It is not an accident of much gravity, and is usually the result of long-continued wearing of the tube. It can only be obviated by changing the shape of the tube and adapting it to the conditions that arise. The expulsion of the tube in the act of coughing cannot always be avoided, though it usually arises from the instrument being too small, in which case a larger and more closely fitting tube should be introduced. One of the gravest difficulties which is encountered is in the interference with the act of deglutition which the presence of the tube entails. This is one of the most difficult features to overcome after intubation, and is present to a more or less well-marked degree in the large majority of cases. The only thing to do to meet this symptom, if it presents to such a degree as to prove a source of great annoyance, is to restrict nourishment largely to fluids, these being more easily expelled from the trachea than solids. If, however, they are taken very slowly, they may pass into the œsophagus without entering the larynx. Failing other measures, the child can be placed on its chest and made to draw fluids through a pipette.

The length of time which the tube should remain *in situ* depends largely on the progress of the case as evidenced by general symptoms. If the febrile movement subsides and the tendency to formation of a false membrane in the fauces disappears, and convalescence seems established, the tube should be of course removed. Practically, we allow it to remain as long as there is any dyspnœa to overcome.

In 158 successful cases collated by O'Dwyer,[1] the average time during which the tube was retained was five days and two hours; in his own cases, the longest time was fourteen days, and the shortest fourteen hours. He further states that the younger the patient the longer the tube will be required; in children under two years it is rarely safe to take it out under seven days.

The removal of the tube is generally considered a somewhat more difficult manipulation than its insertion. When this is to be done, the index finger of the left hand is passed into the laryngeal opening until the collar of the tube is felt in the larynx, when the extractor, held in the right hand, its distal extremity guided by the left forefinger in position, is passed along until it comes into position immediately over the upper extremity of the laryngeal tube, when it is passed into the aperture, and its blades being separated by the pressure on the lever, it is grasped in such a way as that it may be withdrawn with it.

[1] Croup and Diphtheria," Billington and O'Dwyer, New York, 1889, p. 278.

CHAPTER XVII.

SYPHILIS OF THE FAUCES.

THE mucous membrane of the fauces seems to be a favorite site for the manifestation of syphilitic disease in its various stages. It is involved, probably, in a given number of syphilitic patients far more frequently than any other portion of the body, with the possible exception of the skin. This is partially explained, perhaps, on the ground that the skin and mucous membranes are somewhat intimately associated, both from a physiological and pathological point of view. This, however, suggests no explanation of the fact that the mucous membrane of the upper air tract is more frequently involved than mucous membranes elsewhere. The principal reason of this is found, perhaps, in the near location of the parts to the outer world, and the frequency with which they are involved in chronic morbid processes, whereby the local manifestations of the specific disease are to an extent encouraged.

If, as Jonathan Hutchinson[1] teaches, syphilis is practically a continued fever, with distinct stages of prolonged duration, the close analogy between it and measles, scarlet fever, small-pox, etc., is still further emphasized by the frequency of faucial manifestations in each.

The manifestations of syphilis which we meet with in this region are: *first*, the primary lesion; *second*, erythema of the fauces; *third*, the mucous patch; *fourth*, the superficial ulcer; *fifth*, gummatous deposits; leading to *seventh*, the deep ulceration of syphilis; and, *eighth*, cicatrical deformities.

THE PRIMARY LESION.

The possibility of the entrance of the syphilitic virus into the blood through the mucous membrane of the fauces, as evidenced by the existence of a hard chancre in this region, would naturally be regarded as exceptionally remote. An examination of the literature, however, shows us that it is by no means a rare occurrence. The very unexpectedness of such an occurrence, would naturally

[1] "Reynolds' System of Med.," vol i., p. 287.

lead an observer to report the case as one of rare instance; hence it is probable that a large proportion of the cases that have been recognized have been put on record. The mucous membrane of the palate, faucial pillars, and pharynx, presenting, as it does, a somewhat dense tissue coated with squamous epithelium, affords little opportunity for the entrance of the syphilitic virus. The surface of the tonsil, however, on the other hand, with the open mouths of its crypts, presents an exceptionally favorable site for the lodgment of the virus. Hence, the consideration of the primary lesion in the fauces is confined practically to chancre of the tonsil.

ETIOLOGY.—An erosion of the mucous membrane is usually considered necessary for the entrance of the virus. This is not, I think, a common condition of the tonsil. Hence, I take it, the suggestion is a plausible one that the poison, lodging in the tonsillar crypt, its entrance into the circulation is aided by a certain permanency of contact. Bogolgieboff,[1] out of 753 cases of chancre, found the primary lesion upon the tonsil in one case. Mauriac[2] has found the primary lesion in this locality in two cases, while Schadek[3] has collated 68 cases of the initial lesion occurring in the fauces. Of these 68, however, in 22 the histories are so incomplete that the diagnosis is open to question. Of the 46 remaining, in 34 the lesion was located upon the tonsil, and in 12 in other parts of the fauces.

A very natural suspicion in these cases is that the method of contraction is by some infamous practice. While many cases undoubtedly were contracted in this way, quite a large proportion are traceable to a different origin. Thus, in Petersen's case, the husband contracted a tonsillar chancre from the wife, who suffered from a similar lesion on the gum. Schirajew[4] reports a case in which a mother contracted a chancre of the tonsil from a syphilitic child, who became infected by a wet-nurse. Gonduoin[5] reports a similar case, in which the nurse was the sufferer. Hulot[6] reports 4 cases. In one the source of the disease was a chancre of the lip in a child; in a second, the source was in mucous patches in the mouth of a child; the third was in a chancre of the neck; while a fourth was from impure practices. A curious case is reported by Spillman,[7] in which a woman of 59 contracted the disease from the nursing-bottle of a child with congenital syphilis.

[1] Cited by Petersen: Monatschrift für prakt. Dermat., 1888, vol. vii., p. 307.
[2] "Maladies vénériennes," Paris, 1883, p. 328.
[3] "Ueber die syphilitischen Initialsklerosen des Rachens," Kiew, 1884.
[4] St. Petersburger med. Woch., 1880, p. 323.
[5] L'Union méd., 1869, 3d series, vol. vii., p. 553.
[6] Annales de Derm. et Syph., 1878 and 1879, vol. x., p. 29.
[7] London Med. Record, 1879, p. 282.

Wigglesworth[1] reports the case of a medical student who became infected in attempting to revive an asphyxiated new-born child by blowing into its mouth. Other cases have been cited by Rollet,[2] Desnos,[3] Belhomme and Martin,[4] Julien,[5] Mackenzie,[6] Barthelmy,[7] Merklen,[8] Boeck,[9] Lavallée,[10] Hue,[11] Légendre,[12] Brocq,[13] Bumstead,[14] Pivadran,[15] Donaldson,[16] Taylor,[17] Thomaschewsy,[18] Fox,[19] Rabitsch,[20] and Tschistjakow.[21] The case reported by Glauert[22] is of somewhat doubtful character.

In many of the above cases the source of the disease was in impure practices, while in others it arose from kissing, the use of drinking-vessels, pipes, etc.

The disease usually occurs in adults, but is more frequent among men than women.

Of 30 cases collated by Schadek, 18 occurred on the right tonsil and 12 on the left. In several cases the development of the chancre followed an attack of acute follicular tonsillitis, which would seem to suggest that an acute inflammatory process might favor the entrance of the virus.

SYMPTOMATOLOGY.—In most instances the chancre occurs upon an hypertrophied tonsil, which, as before stated, seems to present favoring conditions for the entrance of the virus. The local morbid process is usually of an aggravated character—more so than when the sore is situated upon the penis.

The first symptom to which it gives rise is that of an aggravated sore throat, with pain in deglutition. This, in spite of ordinary treatment, increases in a marked way, until the local symptoms are of a distressing character; the tonsil becoming notably enlarged as the result of the inflammatory action, which involves the tissues beyond

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[1] Cited by Taylor: Trans. of the New York Acad. of Med., 1886, vol. iv., p. 271.

[2] "Traité de la Syph.," Paris, 1861, p. 288.

[3] Comptes Rendus Soc. méd. de Lyon, 1861–62, pp. 45, 70.

[4] "Traité de Path. vénérienne," 1864. [5] "Traité de Mal vénérienne," 1879.

[6] "Diseases of the Throat and Nose," Am. ed, Philadelphia, 1880, vol. i., p. 99.

[7] Annal. des Mal. de l'Oreille, 1880, vol. vi., p. 316.

[8] Annal. de Derm. et Syph., 1881, vol. ii., p. 673.

[9] Tidskrift für prakt. Med., 1883, No. xiii.; Monats. für prakt. Dermatologie, Oct., 1883, vol. ii., p. 317.

[10] Annal. de Derm. et Syph., 1883, 2d series, vol. iv., p. 39.

[11] La France Méd., 1883, vol. i., p. 752.

[12] Arch. gén. de Méd., 1884, 7th series, vol. xiii., pp. 63 and 292.

[13] Cited by Légendre: Loc. cit.

[14] Cited by Knight: New York Med. Jour., 1884, vol. xxxix., p. 662.

[15] Thèse de Paris, 1884, No. 338.

[16] Med. News, Philadelphia, 1885, vol. xlv., p. 173. [17] Loc. cit.

[18] Wien. med. Presse, 1886, vol. xxvii., p. 969 et seq.

[19] Cited by Taylor: Loc. cit. [20] Berl. klin. Woch., 1887, vol. xxiv., p. 306.

[21] Cited by Petersen: Loc. cit., p. 314. [22] Berl. klin. Woch., 1882, p. 750.

the borders of the local sore, while the pain becomes constant and assumes a lancinating character.

Very early in the history of the disease, the submaxillary and cervical glands of the affected side are indurated. This cervical bubo is of a much more serious character than that which occurs in the groin, being larger and at the same time tender to pressure, and painful. No case of suppuration, however, has been observed. In the case reported by Lavallée, the constitutional disturbance was very severe, as evidenced by fever, general malaise, and intense headache. This, however, does not seem to be the rule.

Occasionally the tonsil of the opposite side becomes inflamed, but never the seat of a similar lesion.

DIAGNOSIS.—The characteristic appearances which enable us to recognize a chancre of the tonsil are in the somewhat sluggish ulceration which ensues, together with the induration surrounding it and the unilateral enlargement of the cervical and submaxillary glands. The lesion presents the ordinary appearances of chancre, with this exception, that in most instances it covers a wider area, involving more or less of the whole surface of the tonsil.

The surface of the ulcer is granular in appearance, of a grayish color, and is covered with inspissated mucus. There is ordinarily no evidence of destruction of tissue, although in the case reported by Brocq [1] the ulcer took on something of a phagædenic character. The induration usually involves the whole of the tonsil, and is thus somewhat dependent upon the amount of hypertrophy of which the organ is the seat. If the lesion is a small one, we meet with the ordinary button-like induration of chancre of the penis. The surface of the ulcer is usually flush with the surrounding tissues, and hence presents none of the appearances met with in the gummatous ulcer of syphilis.

Merklen's case was that of a woman aged sixty-four, in whom the appearances suggested epithelioma. The early appearance of the cutaneous eruption, however, cleared up the diagnosis. This rapidity of development seems to be rather characteristic of tonsillar chancre. This is easily explained by the fact that the virus makes its entrance immediately into a somewhat rich plexus of lymphatics. If, therefore, there is any doubt in the diagnosis of a given case, the early appearance of the eruption will serve to clear it up. This may be looked for in from two to four weeks after a primary lesion in this locality. The secondary eruption, moreover, is in many instances of a papular character, still further indicating a certain activity of the virus, in that a cutaneous syphilide of this variety is usually postponed until the third or fourth month.

[1] Cited by Légendre: Loc. cit.

The microscope shows us that a hard chancre consists essentially of a localized infiltration of the tissue with lymphoid cells, and furthermore that this infiltration seems to extend beyond the deposit proper, both in the adventitia of the blood-vessels and along the course of the lymphatic vessels. These tissue changes in an ordinary chancre confine themselves mainly to the epithelial layer. In the tonsil, however, it would seem that the lymphatics play a somewhat more important part in the development of the local morbid process; the cellular infiltration travelling along the course of the lymphatics involving, sooner or later, practically the whole of the organ.

The cause of the induration, according to Verson,[1] is in the transformation of the infiltrated cells into connective tissue; although Von Biesiedecki [2] considers that this induration is due rather to the crowding together of the cells.

Erythema of the Fauces.

This manifestation of syphilis belongs usually to what is called the secondary stage, and occurs from six weeks to four months after the primary lesion. It consists of a peculiar discoloration of the mucous membrane of the fauces, which presents certain appearances that are almost characteristic of specific disease. The discoloration of the membrane seems to consist of a passive hyperæmia, in which the veins seem to take the prominent part. In consequence of this, the color of the membrane is of a dark red, slightly verging on a purplish hue. This *appearance* is attended with no perceptible swelling of the part, nor is there any notable hypersceretion.

The eruption confines itself entirely to the soft palate and pillars of the fauces, the posterior wall of the pharynx not being usually invaded to any perceptible extent, although it may be the seat of a certain amount of discoloration.

The appearance, which is characteristic of specific disease, and which differentiates this eruption from any other with which I am familiar, consists of the sharp line of demarcation between the affected membrane and the healthy tissue beyond. This line of demarcation is sharply defined at the junction of the hard and soft palate. This appearance I regard as almost pathognomic of syphilitic erythema. The discoloration is of a uniform dull red color.

In many instances the tonsils are also invaded by the eruption,

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[1] Virchow's Arch., 1869, vol. xlv., p. 117.

[2] "Beiträge zur phys. und path. Anat. der Haut," Sitzung der Kais. Acad. zu Wien, 1867, p. 233.

and present a slightly swollen appearance with the same peculiar *change in color*. This, however, is not the invariable rule.

The onset of this condition is somewhat insidious, and usually gives rise to no symptoms which would call attention to any local disorder in the fauces. In most instances, probably, it is discovered on an inspection of the throat for diagnostic purposes; although occasionally the patient may experience some little sense of dryness or stiffness in the part, especially recognizable on deglutition.

While the eruption usually appears in connection with a cutaneous erythema, it may also occur coincident with a papular or erythemato-papular syphilide. According to Mauriac,[1] where we have the cutaneous erythema assuming a circinate or annular form the same appearance is reproduced in the faucial eruption.

An erythema of the fauces, then, is closely analogous and practically the same as the cutaneous erythema. Mauriac[2] recognizes a still further analogy in the desqaumation which occurs from the faucial mucous membrane with the subsidence of the eruption.

The Mucous Patch.

This is one of the earliest and most persistent of the specific manifestations with which we meet in the fauces. It is usually classified as belonging to the secondary stage of the disease; and, although it is more frequently met with in the earlier stages of syphilis, it may occur at any period. The usual period for its first occurrence is from six weeks to three months after the primary sore. It bears no direct relation to any individual cutaneous eruption, but manifests itself quite independently of them. Most writers take the view that there is a certain analogy between the mucous patch and the cutaneous syphilides, in that the two occur together. In my own experience, those cases in which the mucous patch has developed in connection with a cutaneous syphilide have not been the rule. According to Keyes,[3] they occur usually in connection with papular eruptions of the skin, and may outlast several crops of the different eruptions. It is of course a local manifestation of the blood poison, and the peculiar deposit in the mucous membrane of the fauces is excited by the previously existing blood poison rather than by any predisposing local cause. While, as before stated, they most frequently develop in the early history of the disease, it would seem that there is no period of syphilis which is exempt from their occurrence.

The mucous patch is probably by far the most contagious of

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[1] Op. cit., p. 530. [2] Loc. cit.

[3] "Genito-Urinary Diseases with Syphilis," New York, 1888, p. 598.

all secondary manifestations of specific disease, and is quite as contagious, if not more so, than the primary sore. Moreover, direct contact is not necessary for transmission, in that the saliva and mucous secretions of the mouth may convey the contagious material. In discussing, in a former chapter,[1] the question of the transmission of syphilis to offspring, the view was taken that this was impossible if three years had elapsed in either parent after the occurrence of the primary sore. If this be true, it must follow that, after the lapse of a similar period from the primary lesion, it is impossible to convey the disease to another through the secretions of any of the various local lesions. Hence, while the earlier mucous patch is exceedingly contagious, those which occur later than three years must be regarded as innocuous in this respect.

PATHOLOGY.—The local morbid changes which characterize a mucous patch, whether in the mucous membrane or in the skin, seem to be of the character of the first stage of a localized inflammatory process, wherein there is notable dilatation of the blood-vessels over a certain area, with an escape of serum, while at the same time the tissues become infiltrated with embryonic cells. The process differs from inflammatory action, however, in the fact that not only the tissues, but the walls of the blood-vessels themselves are invaded by this cellular infiltration. This augmentation of cells has its source both in the escape of leucocytes from the blood and in the increased activity of cell proliferation, which is excited in the epithelia. This augmentation of the cell elements, while not sufficient to produce necrosis, with resultant ulcerative action, does produce a certain amount of atrophy, especially of the superficial epithelia, under the influence of which the cell contents or nuclei disappear, and the cell wall becomes filled with the serum, the source of which is in the blood. This serum, as we have before seen, is highly charged with young cells. Hence, as it makes its way through the membrane and appears on the surface, it not only accounts for the free secretion which is met with on the surface of a mucous patch, but also explains the opaline appearance which they present.

Zeissl[2] describes, under the name of angina papulosa syphilitica, a papular eruption in the fauces, which is closely analogous to the papular eruption on the skin, which consists of small, dark red patches scattered about through the mucous membrane. This eruption of Zeissl's is, really, I think, the first stage of the mucous patch, the period of which is clearly indicated in the pathological condition above given. When we consider that Zeissl's papules become fully developed mucous patches in the course of but a few

[1] Vol. i., p. 365. [2] "Syphilis," vol. ii., p. 201.

hours, it would scarcely seem that their recognition was of any great importance.

Occasionally the local morbid process which gives rise to a mucous patch assumes a somewhat efflorescent character, wherein the activity of the process is greatly exaggerated, while at the same time the serous exudation contains a large amount of fibrin.

As a natural consequence, there results a fully developed false membrane which is deposited upon the surface. Zeissl[1] likens this membrane to the diphtheritic, while Mauriac[2] directly designates it the diphtheritic placque, calling attention, however, to the fact of the absence of the characteristic microbe. The term diphtheritic, I think, is a misnomer in this connection, in that the process is croupous rather than diphtheritic, tissue-necrosis being in no way a result of this excessive morbid action.

A continuation of the morbid changes may result in a superficial exfoliation of tissue and the ultimate development of a superficial ulcer, or, on the other hand, the round-cell infiltration, invading the deeper layers of the membrane, may become a permanent element of tissue, giving rise to the hypertrophic plaque. A still further extension of the same process may result in the vegetative plaque or broad condyloma.

SYMPTOMATOLOGY.—The presence of these patches ordinarily gives rise to no very marked subjective symptoms other than a sense of discomfort and stiffness in the parts, which is aggravated by the act of deglutition. Their special feature consists in their acute sensibility, under which they become exceedingly painful to the impact of all foods or drinks, except those which are of the blandest and most unirritating character. If the area over which the patches are distributed is large, this symptom becomes not only a very unpleasant one, but may even become so distressing as to interfere with proper taking of nourishment. Pepper and salt, and especially acids, are exceedingly irritating to these patches, giving rise to not only pain on deglutition, but to an aggravation of the local symptoms.

DIAGNOSIS.—In its early stages, a mucous patch presents as a small, bluish-white, opalescent area lying upon an apparently healthy mucous membrane. Being the result of an infiltration, the membrane is naturally to a slight extent thickened at this point, although this is not ordinarily appreciable on inspection. In appearance, it so closely resembles an area of mucous membrane which has been recently touched with a stick of nitrate of silver that even an experienced observer might find it difficult to distinguish between the two conditions. A single patch is something of a rarity, in

[1] Loc. cit. [2] Op. cit., p. 616.

that they usually appear in groups of small patches, scattered about on one or the other side of the fauces. The early patch usually makes its appearance, somewhat in the order of frequency, on the soft palate and uvula, the anterior face of the anterior pillar, the face of the tonsil, and the anterior face of the posterior pillar. Practically it never is seen on the pharyngeal wall.

It is a universally accepted law now, I believe, that syphilis is not auto-inoculable, and yet, in connection with mucous patches in the fauces, we very frequently meet with a somewhat curious and yet characteristic appearance, in which a chain of mucous patches on one side of the throat have been exactly reproduced on the other side, giving rise to what has been called the Dutch garden aspect of faucial mucous patches, so named because the group presents an absolutely symmetrical appearance on both sides. This can only be accounted for by the action of the parts in deglutition, wherein the tonsil and pillars of one side are brought in direct contact with the tonsil and pillars of the other, with the result, apparently, of a reproduction in perfect outline of the lesion. It is the universal teaching that an inoculation of the secretions of a mucous patch can only give rise to a primary sore. In the case of the mucous patch, therefore, we must content ourselves with the view that the frequent contact of the patch on one side of the fauces has given rise to a similar condition on the opposite side, without regarding it as evidence of the auto-inoculability of the disease.

If the disease has persisted for some time, these patches become more opaque in character and project above the surface. Furthermore, their edges seem to spread, and one patch unites with another, thus forming somewhat elongated or broad areas over the infected surface. When this occurs, the patch is raised above the surface, thicker, wider, more opaque in color, and seems to excite a certain amount of local inflammation about it, in that now we find for the first time an area of redness in the mucous membrane surrounding it, which is not present in the early stage. As a result of the thickened surface, and in consequence of the frequent movements of the parts, we have cracks and fissures forming which bleed easily to the touch. This is especially true where the disease occurs on a fold of mucous membrane, as on the edges of the palate or faucial pillars.

This condition constitutes what is generally known as the scaly patch, and may develop from the soft, smooth patch of the early stages of the disease as the result of its persistence, or it may be met with in the later stages of the disease, five and even ten years after the primary sore. Occurring at this period, it is usually of

the scaly variety, from its first appearance. In this stage also we find it making its appearance on the posterior wall of the pharynx for the first time. Either of these forms of patches should be easily recognized on inspection.

Where the local process assumes a fibrinous character, giving rise to a false membrane, the disease may be mistaken for diphtheria. Thus, in a case reported by Robin,[1] not only the local lesion, but the febrile disturbance, and the great systemic depression of the patient presented all the appearances of diphtheria. The diagnosis was made clear by the coincidence of a cutaneous syphilide. A somewhat similar case is reported by Féréol.[2] In a case observed by Mauriac[3] the diagnosis was only established by the course and progress of the disease.

COURSE AND PROGNOSIS.—This local manifestation of syphilis is probably one of the most obstinate with which we have to deal, for, although quite amenable to local and constitutional treatment, these patches frequently recur with a persistence which is oftentimes equally annoying to the patient and the physician. This is especially true of the scaly patch, which occurs in the later stage of syphilis. I am not prepared to state that the mucous patch ever becomes a purely local disease, and yet I have certainly seen a number of instances in which, while the constitutional affection seemed to be satisfactorily under control, yet the mucous patches recurred in the mouth and throat from time to time in such a manner as led to the suggestion that, as the result of the local morbid process primarily due to syphilis, a non-specific local affection had resulted, under the influence of which this eruption upon the mucous membrane came on from time to time from some cause other than the specific blood poison.

The ordinary mucous patch shows no marked tendency to undergo ulcerative action. When, however, it has developed into the thick broad and scaly patch, as the result of persistency or under the local irritating influence of alcohol, the use of tobacco, or some other cause, the activity of the cell proliferation becoming thereby increased, tissue necrosis is liable to occur, whereby the whole mass breaks down into ulcerative action, giving rise to the superficial ulcer of syphilis. It is not intended to convey the idea, by this statement, that the soft mucous patch of the early period may develop into the superficial ulcer, but that when recurrent attacks of mucous patches occur, each fresh crop is liable to be thicker, and to assume what Mauriac calls the hypertrophic form,

[1] Gaz. méd. de Paris, 1886, 7th series, vol. iii., p. 313.
[2] L'Union méd., 1881, 3d series, vol. xxxii., p. 877.
[3] Op. cit., p. 622.

and that finally, after a period of from two to three years, the superficial ulcer may result. This source, however, of the superficial ulcer I consider as a somewhat rare one, in that this form of ulceration usually follows immediately upon a superficial gummatous deposit.

The Superficial Ulcer.

This form of ulcer is usually regarded as belonging to the secondary period of syphilis, and is met with in from one to three years after the primary lesion. As before stated, it may occur as the result of the breaking down of tissue in the erosive mucous patch. This, however, is not its ordinary method, in that in the very large majority of instances it undoubtedly results from the breaking down of a gummatous deposit.

The essential pathological lesion which gives rise in the one case to a mucous patch, in another case to the superficial ulcer, and still later to the deep ulcer, is practically the same in all, the only difference being in the extent of tissue involved. In the mucous patch the infiltration is very superficial, and shows little tendency to ulceration. In the superficial ulceration, on the other hand, the infiltration extends into the deeper tissues of the mucous membrane, and early ulceration is the rule. Again, in the deep ulcer the infiltration extends not only into the mucous membrane, but into the tissues beyond, and in breaking down gives rise to the peculiar crater-like ulcer of late syphilis. Hence, therefore, while we draw a distinction between the superficial and deep ulcer, it is mainly in order that we may recognize the fact that the extent and depth of the destructive process bears a somewhat close relation to the period of the syphilitic disease in which it occurs. The superficial ulcer, therefore, which results from a broken-down mucous patch presents a somewhat different clinical history from that which occurs as the result of the breaking down of a simple infiltration of tissue by gummatous material. The point, however, is not one of practical importance.

No special reason can be assigned for the occurrence of this form of ulcer other than in the statement that the specific virus which constitutes the disease, reproducing itself in the blood, increases in intensity in such a way that as the years go by a localized outbreak in the faucial mucous membrane assumes a more active type; in other words, when we have a gummatous infiltration of the membrane, the longer time that has elapsed since the primary lesion, the more deeply are the tissues liable to be infiltrated in this local outbreak by the gummatous material, and hence the greater the area involved in the resulting ulcerative action.

In the order of frequency, it is met with on the tonsil, the soft palate, the anterior pillar, and the plica salpingo-pharyngea. In one or two instances I have observed it on the upper surface of the soft palate. This, however, is an exceedingly rare location.

It usually occurs in a somewhat elongated ovoid form, and shows but slight disposition to extend. Moreover, like other forms of ulceration in this region, there is a notable hesitancy in transgressing anatomical boundaries. The primary gummatous deposit, occurring as it does in soft yielding tissues, gives rise to no marked symptoms which direct attention to any lesion in the throat. Moreover, it is probable that the ulceration follows so rapidly upon the deposit that the occurrence of the latter might be easily overlooked.

When the ulcer has fully developed, the patient is conscious of a sense of uneasiness and stiffness in the parts, with a certain amount of dysphagia. This latter symptom is somewhat dependent upon the location of the ulcer. If it is on the soft palate or posterior wall of the pharynx, each act of deglutition may be accompanied by a sharp, lancinating pain, which occasionally is quite severe in character. In addition to this, there is a certain amount of secretion of pus from the part, which is liable to be tinged with blood. If the palate is involved, its movements are necessarily hampered, and the voice may be somewhat affected.

DIAGNOSIS.—The recognition of these ulcers is ordinarily quite simple, by ocular inspection. They, as before stated, present an elongated ovoid shape, with a shallow, depressed surface. The mucous membrane surrounding the ulcer is not ordinarily the seat of much inflammatory action; hence, while an areola may be noticed, it is limited in extent. The immediate border of the ulcer, however, shows a defined red color. The secretion from its surface is a bright yellow, healthy-looking pus, or it may be a thick-ropy muco-pus, dependent upon the extent and activity of the ulcerative action. If the secretion is removed, we find beneath a grayish-pink surface, which bleeds easily to the touch. The extent of tissue involved and the superficial contour of this form of ulcer have already been clearly indicated.[1]

As already stated, I do not believe these ulcers possess any notable tendency to extension. This is due to the fact that the whole of the primary gummatous infiltration breaks down and disappears in the ulcerative action. If neglected, the ulcerative process may persist for a considerable period, and, acting as a point of local irritation, undoubtedly may serve to invite to this point a new deposit of gummatous material, and as a result there occurs

[1] Vol. i., p. 340.

an extension of the ulcer. In other words, I do not believe that syphilitic ulcers extend by a progressive infiltration of the tissue with gummatous material, but rather by periodical explosions, as it were.

The Gummy Tumor.

This term, in the present consideration, is restricted to those rare instances in which the infiltration of the tissues with gummatous material assumes the form of a distinct tumor of the fauces, and which presents as such for treatment before the mass has broken down into the deep ulcer of syphilis.

In the very large majority of instances, where the deeper tissues become the seat of a gummatous infiltration, the breaking down occurs so rapidly that when the case comes under observation it presents as the deep ulcer, rather than as the gummy tumor. In rare instances, however, the breaking down is delayed, and the case presents itself in the form of a tumefaction; hence it becomes a matter of some importance to recognize it as such, in order that the extensive destruction of tissue which the ulcerative process naturally involves may be avoided. It belongs to the later stages of syphilis, and occurs from five to fifteen years after the primary lesion.

As illustrating the duration of a gumma and the rapidity of the breaking down, the following case, reported by Fournier,[1] possesses an especial interest. The patient, an adult female, presented with a history of a tumor in the throat which, coming on suddenly, had persisted for two weeks, giving rise to a moderate amount of pain with dysphagia and regurgitation of food into the nose. At the end of this period she experienced a sudden sense of relief, and retired the same evening with almost complete relief to all the symptoms. On arising next morning, however, deglutition was more painful than ever, and when seen by Fournier a large portion of the soft palate had been destroyed by a tertiary ulcer. Fournier explains the symptoms in this case as follows: A large gummy tumor developed in the soft palate, and persisted for two weeks, but finally softened, broke down, and discharged on the upper surface. This was followed by immediate relief. During the night, the softening of the gummy material extended until the ulceration broke through on the under surface of the palate, whereupon there was a recurrence of distressing faucial symptoms.

It is not easy to determine how long a gummy tumor may exist before ulceration. It is probably dependent on the location. A gumma of the posterior wall of the pharynx being necessarily

[1] Gaz. des Hôp., 1867, pp. 460. 463, and 472.

subjected to a great deal of mechanical irritation and pressure in the act of deglutition, it would seem that in this location it should break down quite early.

Hunter Mackenzie[1] reports a case of a tumor of this sort extending from the border of the palate to the entrance of the larynx, and encroaching quite extensively upon the pharyngeal cavity, which only came under observation at the end of two and a half months. It was completely dissipated by internal medication. Somewhat similar cases are reported by Hontang[2] and Hischmann.[3]

According to Zeissl,[4] the most frequent site for a gummy tumor of the palate is on its posterior surface; and when they develop here they may persist for quite a prolonged period of time, and escape observation until ulceration occurs.

The symptoms to which a gumma of the fauces gives rise seem to be mainly those of mechanical interference with the function of the parts, both in deglutition and phonation. The peculiar osteocopic pains, of course, are not met with in gumma either of the soft palate or tonsil, and, if occurring in the pharynx, would necessarily indicate that the deeper tissues were involved, and probably the periosteum. In a case of this sort which occurred in my own practice, these pains were of a most violent character, and the nocturnal exacerbations distressing in the extreme. The tumor, which presented in the pharynx, was, however, limited in extent.

The pathological changes which constitute a gummatous deposit in the faucial mucous membrane differ in no essential degree from that described in a previous chapter[5] as involving the nasal mucous membrane.

Diagnosis.—The recognition of a gummatous tumor of the fauces is always a problem which in most instances will prove an exceedingly difficult one to solve. The tumor is hard, dense, resisting, not especially painful to the touch, and unattended with any evidences of inflammatory action, the mucous membrane covering it being of a paler hue usually than the normal, the blood-vessels of the mucous membrane investing it being exsanguinated by the pressure of the tumor. In the soft palate it is usually a rounded symmetrical mass, while in the pharynx it may be somewhat irregular in outline, and usually unilateral, except in the case of the broad superficial deposits which Fournier[6] calls the "gomme en nappe."

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[1] Lancet, London, 1881, vol. ii., p. 949.
[2] Annal. des Mal. de l'Oreille, vol. xiv., p. 65.
[3] Annal. des Mal. de l'Oreille, vol. xv., p. 312.
[4] Op. cit., p. 204.
[5] See vol. i., p. 343.
[6] Annal. de Derm. et Syph., 1873–74, vol. v., p. 435.

In the soft palate the main question of differential diagnosis lies in the exclusion of adenoma and fibroma, while in the pharynx it lies between fibroma, sarcoma, and carcinoma. These questions will necessarily be decided on the general appearances of the growth, together with the clinical history in each individual case, and many instances will only be definitely determined by the experimental administration of antisyphilitic remedies.

The difficulties of diagnosis are very curiously illustrated in a case of faucial tumor reported by Maisonneuve,[1] in which a serious operation was done for its extraction under the impression that it was carcinoma. The extirpation was successfully accomplished, but, recurrence taking place, the tumor disappeared now under the administration of iodide of potassium.

The Deep Ulcer of Syphilis.

This lesion of syphilis is the direct result of the softening and breaking down of the gummy tumor, and therefore belongs essentially to what is termed the tertiary form of the disease. The extent of area and the depth of tissue involved, as we have before seen, are entirely dependent upon the extent and area of the original gummatous infiltration. As before noted, the longer the period which has elapsed since the primary lesion, the deeper and more extensive are the gummatous deposits liable to be. Hence, the extent of the ulcerative process is entirely governed by the extent of the original infiltration.

We have already discussed the pathology and clinical history of this form of syphilis, in connection with diseases of the nasal passages,[2] and what was there stated in regard to the disease in the nasal cavity is equally true in connection with the same lesion in the fauces. The point was there made that the extent of the ulceration was limited by the extent of the primary deposit. This feature of syphilitic ulceration I regard as of very great importance, and I believe that the recognition of it will enable us to arrive at a more intelligent understanding of the clinical history and prognosis of this form of destructive action.

A gummy deposit comes on with great suddenness, involving a certain extent of tissue, giving rise to adventitious tumefaction. This, as we have already seen, may persist for a few hours, or in rare cases for a number of days, when as the result of the close crowding together of the infiltrated cells, together with the shutting off of the blood supply, the mass softens and breaks down, giving rise to an ulcerative process. This softening commences in

[1] "Leçons cliniques sur les Maladies cancereuses," Paris, 1854. [2] Vol. i., p. 344.

the centre of the mass, and rapidly involves the whole of the tissues in which the gummatous material has been deposited.

It is a common belief that the ulcer extends by a more or less rapid process of erosion of tissue, under the influence of the syphilitic virus. This I believe to be a wrong view. If there is any extension of the margin of the ulcer, it is due to the fact that the cellular infiltration in the periphery of the gumma is less dense than that of the centre, and hence, while the process extends, it is a slow process, but still entirely influenced by the previously existing gummatous infiltration.

By far the most frequent site of this form of ulcer is the posterior wall of the pharynx; next in frequency we find it in the soft palate and pillars, and lastly in the tonsils. Here, as in other regions of the body, the disease shows a marked hesitancy in transcending anatomical boundaries. If it attacks the pharynx, it rapidly involves the whole of this region, limiting itself at the posterior pillars laterally, the level of the larynx below, and the pharyngeal tonsil above, although here it is no rare event to find it extending somewhat into the vault of the pharynx. I have never seen an instance, however, in which it involved either the nasal cavity or larynx by extension.

When attacking the soft palate, it produces rapid destruction of the part, but still confining itself to the original deposit. In most instances it is unilateral, thus showing a hesitancy in transcending the median line. If it occurs in the tonsil, in rare instances it may pass into the soft palate, although I should regard this as an unusual event.

In asserting that the ulcerative process does not extend beyond the site of the original gummy deposit, the idea is intended to be conveyed that there is no new and progressive deposit of gummatous material beyond the site of the original ulcer. The syphilitic virus, in giving rise to gummatous deposit, seems for the time to have exhausted itself in this local explosion, as it were. Secondary deposit, of course, is possible, but this is only as the result of a second outbreak, after a longer or shorter period of time. As evidence that the ulceration only involves the original gummy deposit, I have not infrequently seen, not only in the pharynx, but in the soft palate, a deep ulcer limiting itself to but a small portion of the organ, and which, persisting for days and even weeks, has shown no tendency whatever to extend to the neighboring tissues.

Symptomatology.—The occurrence of the ulceration usually gives rise to an aggravation of the symptoms, which may have previously existed in a case of gummy tumor, in that the pain on deglutition becomes more marked and the movements of the fauces

more hampered, while at the same time there is a very notable increase in the secretions of the part. This, being of a thick, ropy pus, accumulates upon the surface of the ulcer, and is expelled with considerable difficulty. The prominent symptom, of course, is pain on deglutition, while the other symptoms to which the disease may give rise are dependent upon the character and location of the ulcer. If the palate is involved, this is very rapidly destroyed. Hence its function is abolished, and food and drink are liable to make their way into the nasal cavity.

Serious hemorrhage as the result of destruction of blood-vessels is an exceedingly rare accident, although this possibility should be borne in mind. Wigglesworth and Cushing[1] report a case in which hemorrhage, although permanently arrested, seems to have led to death on the fifth day from exhaustion. There was albuminuria with anasarca. The specific disease was probably congenital.

Articulation, of course, is interfered with, according to the location and extent of the ulcer.

DIAGNOSIS.—The appearances of this form of ulcer in the fauces are the same as those already described in connection with the nose. There is a well-marked areola, the edges are sharp cut and well defined, the surface of the ulcer is markedly depressed below the surrounding mucous membrane, and is covered with more or less profuse secretion of pus, interspersed with threads of necrotic tissue. There is no form of ulcerative action which presents the aspect of the deep ulcer of syphilis, and hence I do not think that, as a rule, a diagnosis should present any very great difficulties.

After the ulcerative process has exhausted itself in the throwing off of the gummatous matter, it is liable to assume a somewhat sluggish although persistent form, in which there is but a limited effort at repair, owing probably to the systemic poison. Under the administration of remedies, however, the reparative effort seems to be characterized by an excessive activity, as evidenced by the extensive cicatrization and contraction of tissue which marks the site of the original ulcer.

SEQUELÆ.—If the disease attack the soft palate or tonsils, the only sequelæ to be considered are the vigorous cicatrization and contraction of the tissue, with the resulting deformity. When the ulceration is situated in the pharyngeal wall, in the very large majority of cases, it extends through the whole depth of the mucous membrane, resulting in its complete destruction. A deeper involvement of tissue is an exceedingly rare event, although both

[1] Reports of the City Hospital, Boston, 1882, 3d ser., p. 354.

Hunter Mackenzie[1] and Zeissl[2] state that the deposit may occur primarily in the vertebral periosteum, resulting in bony necrosis. Instances are reported by Fischer,[3] Wade,[4] and Keate[5] in which the atlas was the seat of the disease. The result was the formation and exfoliation of the sequestrum without exposure of the cord. That this necrosis may result in an exposure of the spinal cord, however, is shown by the cases reported by Hobbs,[6] Bardeleben,[7] and Gürlt[8] in which this occurred. A further sequel may be a purulent meningitis, as mentioned by Fournier.[9]

Cicatricial Deformities of the Fauces.

I know of no lesion which is followed by more marked cicatricial contraction of tissue than the deep ulcer of syphilis in the fauces, unless possibly we may except the cicatrices which are occasionally observed after a burn of the integument in which the fascia has been injured. Where the ulceration has been small, whether on the soft palate or pharynx, the reparative process results in a cicatrix which is characteristic, in that the connective tissue seems to mass itself in the centre, and displays small radiating fibres, resting somewhat above the mucous membrane. Our main interest in this connection, however, has to do with those cases in which the ulceration has invaded such large areas of the fauces that, in healing, extensive cicatrices have resulted, which, in contracting, have produced notable deformity of the parts.

On first inspection of one of these cases, the impression is given that these abnormal adhesions and deformities are the result of union between two ulcerated surfaces, and that the condition has arisen from an involvement of the soft palate, pillars, and the wall of the pharynx in ulcerative action. As before stated, I believe that syphilitic ulceration shows a very marked hesitancy in transgressing anatomical boundaries, and therefore that an ulceration involving the soft palate, pillars, and the pharyngeal wall is an exceedingly rare event. If we study these cases more closely, I think we will find that the abnormal adhesions between the velum and pharynx are the result primarily of an adhesion of a normal palate or pillar to an ulcerated pharynx, or *vice versa*, perhaps. The method in which this occurs, I think, is quite clear. The one

[1] Loc. cit. [2] Op. cit., p. 211.
[3] Deut. Zeit. für Chir., 1885, vol. xxii., p. 420.
[4] Med.-Chir. Trans., vol. xxxii., p. 65.
[5] Med. Gaz., London, 1835, vol. xvi.
[6] Annal. des Mal. de l'Oreille, 1887, vol. xiii., p. 453.
[7] Cited by Zeissl, loc. cit.
[8] Arch. für klin. Chir., vol. v., p. 191. [9] Loc. cit.

part or the other being in a state of ulceration, the membrane opposite is necessarily bathed, to a certain extent, with the acrid secretions from the ulcerated surface. The consequence of this is that the superficial epithelium is destroyed, and the part becomes the seat of an erosion. In this condition an adhesion between it and an ulcerated surface is easily established, if the parts, by any chance, come in contact or remain in contact with each other for any appreciable time, as between the soft palate and pharynx. This may easily occur in the recumbent position, or where the palate is perforated and its attachment to the hard palate relaxed. The same also may be said of adhesions between the posterior faucial pillar and an ulcerated pharyngeal wall, or between the uvula and posterior pillar, as shown in Fig. 30. After the adhesions have

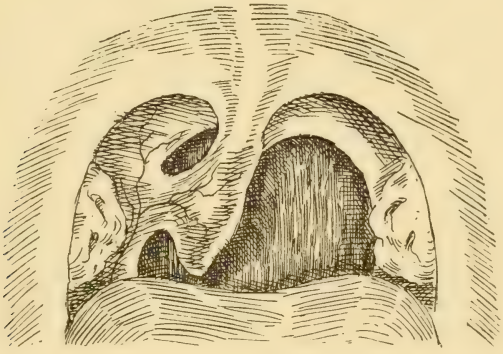

FIG. 30.—Adhesions between the Posterior Pillar and Uvula, the Result of Tertiary Syphilis.

occurred, the subsequent healing of the ulcer must be regarded as the main source of the extreme degree of deformity which is so frequently seen in these cases. This is the view taken by Schech,[1] while Smith[2] takes the ground that the adhesions result from ulcerative action in both regions.

A very common variety of deformity is that in which an adhesion is formed between the posterior faucial pillar and the pharyngeal wall. This is easily accounted for by the pillar coming in contact with an ulceration of the pharyngeal wall. After the adhesion is formed, the cicatrization of the pharynx draws the pillar, and consequently to a certain extent the palate, downward and backward in such a way as to draw the uvula to one side, thus producing a lack of symmetry in the palate. The condition gives rise to no very marked symptoms, in that the palato-pharyngeal space is sufficiently wide to admit of free respiration, while the

[1] Arch. für klin. Med., 1876, vol. xvii., p. 59.
[2] Trans. of the Am. Laryng. Ass'n, 1883, p. 183.

palate is still capable of performing its normal function. The only important symptom which may arise from this condition is an impairment of hearing on that side. This is due in part to a closure of the Eustachian tube and in part to an interference with the movements of the muscles which have to do with the renewal of air in the middle ear. Of course, if the lesion occur on both sides, it becomes more serious, in that the naso-pharyngeal space is narrowed, and the menace to the hearing is notably increased.

Another deformity which may arise is caused by an ulceration of the soft palate, which has resulted in its more or less complete destruction on one or both sides. The cicatrization and contraction following the ulceration give rise to an inflexible condition of this organ, in which case the act of deglutition is liable to become notably impaired, fluids making their way into the nasal cavity. The voice also assumes a curious nasal twang, and articulation is markedly interfered with. The sufferer being unable to shut off the nasal cavity in his attempts at articulation, phonative waves make their way into the nose, and it becomes difficult to propel them into the oral cavity in sufficient amount for clear articulation. In other words, there is a sort of phonatory waste through the nasal cavity.

By far the most common seat of the deep ulcer, as we have found, is in the pharyngeal mucous membrane, and hence the most frequent deformity is found to be adhesions between the soft palate and the pharyngeal wall. In this case there is usually not of necessity any loss of tissue of the soft palate, but the velum, becoming adherent to the pharyngeal wall, when the subsequent cicatrization and contraction occur, it is drawn downward and inward in such a way as to produce, not only more or less complete occlusion of the naso-pharyngeal passage, but also an asymmetrical condition of the parts. This may be due to adventitious features of the cicatricial contraction, or it may be due to the original ulceration being located on one side or the other of the pharynx.

The original adhesion probably occurs in but a limited extent on the free border of the palate, but, as the palate is held in contact with the ulcerated surface, the amount involved in the adhesion increases, so that we may have the upper surface of the palate adherent to the pharynx for a considerable portion of its area.

The uvula may remain pendulous, or it may be closely adherent to the pharynx and practically lost in the cicatrix.

If the condition has resulted from a unilateral pharyngeal ulcer, we have simply adhesion of one side, with a very marked narrow-

ing, as the result of contraction of the opening between the free portion of the palate, and the pharyngeal wall of the opposite side. Occasionally we meet with complete closure of the palato-pharyngeal space. Instances of this sort have been reported by Hoppe,[1] De Cammim,[2] Championnière,[3] Dzondi,[4] Colles,[5] Coulson,[6] Hutin,[7] Malgaigne,[8] Ried,[9] Lublinski,[10] Coulson,[11] Duncan,[12] Van der Hoeven,[13] Flower,[14] Heymann,[15] Dennert,[16] Sigmund,[17] Pauly,[18] and Bourdon.[19]

These cases necessarily are somewhat rare, in that the act of inspiration, together possibly with the secretions of the pharynx, tend to keep open a passage, however small, between the two cavities.

In the many cases of this form of adhesion which have come under my own observation, I have seen none in which complete closure has occurred, although many admitted only of the passage of a very small probe. Cases of this partial closure have been observed by Schech,[20] Zimmer,[21] Fielder,[22] West,[23] Caht,[24] Tobold,[25] Bruzelius,[26] Langreuter,[27] Cheever,[28] Rice,[29] Griffin,[30] Bradley,[31] Cook,[32] Rudtorffer,[33] Turner,[34] Otto,[35] Szymanowski,[36] Pitha,[37] Verneuil,[38]

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[1] Deutsch. Klin., 1852, No. 21.
[2] Gaz. Méd., 1841, No. 159.
[3] Annal. des Mal. de l'Oreille, 1876, p. 88.
[4] "Klin. Institut f. Chir.," etc., Halle, 1818.
[5] "Die venerischen Krank.," übersetzt von Simon, Hamburg, 1839.
[6] Lancet, London, 1862, vol. ii., p. 20.
[7] Gaz. Méd., 1847, No. 12.
[8] "Traité de Méd. operat.," Paris, 1853.
[9] Cited by Turck: "Klin. der Krank. des Kehlkopfes," p. 315.
[10] Berl. klin. Woch., 1883, vol. xx., p. 361.
[11] Lancet, London, 1862, vol. ii., p. 529.
[12] Canadian Practitioner, 1888, vol. xiii., p. 7.
[13] Arch. für klin. Chir., 1861, vol. i., p. 448.
[14] Cited by Turner: Edinburgh Med. Jour., 1860, vol. v., p. 612.
[15] Berl. klin. Woch., 1882, p. 373.
[16] Berliner klin. Woch., 1882, p. 404.
[17] Wien. med. Woch., 1854, vol. iv., p. 752.
[18] Cent. für Chir., 1884, p. 276.
[19] Gaz. méd. de Nantes, 1886, No. 7.
[20] Loc. cit.
[21] Inaug. Dissert., Leipsic, 1868.
[22] Arch. für Heilkunde, vol. xii., p. 212.
[23] Lancet, London, Aug. 9th, 1872.
[24] Deutsch. Klin., vol. xxvi., p. 206.
[25] Wien. Med. Presse, vol. xvi., p. 395.
[26] Hygeia, vol. xxxvii., p. 12.
[27] Arch. für klin. Med., 1880, vol. xxvii., p. 328.
[28] Boston Med. and Surg. Jour., 1878–79, vol. xcix., p. 649; and vol. c., p. 317.
[29] New York Med. Jour., 1885, vol. xlii., p. 711.
[30] New York Med. Record, 1888, vol. xxxiii., p. 37.
[31] Trans. Path. Soc., London, 1871–72, vol. xxiii., p. 100.
[32] Med. and Surg. Reporter, Phila., 1873, vol. xxviii., p. 203.
[33] "Abhandl. über die einfachste und sicherste Operationsmethode eingesperrter Leisten- und Schenkelbrüche," Wien, 1805, vol. i., p. 192.
[34] Edinburgh Med. Jour., 1860, vol. v., p. 612.
[35] "Handbuch. der path. Anat.," Breslau, p. 210.
[36] Prag. Viertljahresschr., 1864, vol. i., pp. 59 and 142.
[37] Cent. für med. Wissenschaft, 1863, vol. i., p. 693.
[38] Bull. de Soc. de Chir., 1876, vol. ii., p. 308.

Hulke,[1] Wirtinger,[2] Paul,[3] Hoffman,[4] Ricord,[5] Hofmokl,[6] and Sokolowski.[7]

The existence of a small opening, however, is a matter of no practical importance, in that the symptoms are identical in the two conditions. These consist of loss of the sense of smell and taste, complete interference with nasal respiration, the development of a certain amount of laryngeal and tracheal inflammation, with a tendency to colds and bronchial attacks. The voice is characterized by total absence of the nasal tones and an impairment of articulation. Impairment of hearing is a constant symptom, which is slowly progressive, although without involving any special tendency to nerve lesion and total deafness.

The accumulation of the secretions in the nose, with inability to clear the passages, becomes a source of very great annoyance. At best, however, the deformity involves serious discomfort and perhaps personal mortification, rather than any special danger, the most serious symptom, perhaps, being that of impairment of hearing.

The condition in the throat is easily recognized, and presents appearances which indicate it to be syphilitic in character, beyond much question.

The special appearance which is characteristic of syphilis, of course, is the vigorous cicatrization with extensive contraction and the presence in the cicatrices of large masses of fibrous connective tissue. The only lesion with which it could possibly be confounded would be lupus. In this latter disease, however, we meet with a nodular infiltration, marked thickening of tissue, total absence of cicatricial contraction, as evidenced by the presence of bundles of fibrous connective tissue with distortions, and, furthermore, we rarely, if ever, in lupus, meet with an ablation of the palato-pharyngeal space as the result of adhesions. Moreover, lupus of the air-passages is generally accompanied by a similar lesion in some portion of the integument.

Another variety of deformity occurs, according to Schech,[8] in those rare instances in which we have a coincident ulceration of both the soft palate and pharynx, resulting in perforation of the palate, and a falling back of the velum upon the pharyngeal ulcer, and the subsequent development of adhesions thereby.

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[1] Med. Times and Gaz., 1863, vol. ii., p. 165.
[2] Wien. med. Woch., 1862, vol. xii., p. 438.
[3] Arch. für klin. Chir., vol. vii., p. 199.
[4] Deut. med. Woch., 1885, vol. xi., p. 489.
[5] Bull. de la Soc. de Chir. de Paris, 1st ser., vol. i., p. 356.
[6] "Bericht der k. k. Krankenanstalt Rudolph-Stiftung," 1884, Wien, 1885, p. 373.
[7] Deut. med. Woch., 1882, p. 426. [8] Loc. cit.

A curious case is reported by Langreuter[1] in which the cicatrix involved the soft palate, pillars of the fauces, and base of the tongue in such a manner that there was almost complete stenosis of the faucial arch. The tongue was drawn up toward the soft palate and back toward the pharynx, while the pillars of the fauces were drawn into the median line. All these parts were merged in the cicatricial ring which existed at the base of the tongue. The stenosis in this case was so great as to render tracheotomy necessary. The primary ulceration, of course, here must have involved the base of the tongue, pillars of the fauces, soft palate, pharyngeal wall, in fact the whole mucous membrane of the fauces. Lublinski's[2] case was somewhat similar.

In a case reported by Gerhardt,[3] as the result of an ulceration apparently involving the pharynx and posterior pillars, the activity of cicatricial contraction developed in the lower portion of the pharynx, giving rise to a sort of diaphragm, as it were, immediately over the entrance of the larynx, through which the tip of the index finger only could be inserted.

The practical result of these deformities, especially where located low down in the pharyngeal wall, is the formation of a stricture. The location of the stricture is undoubtedly at the point of greatest activity in the process of cicatrization, and this probably occurs at the point where the original gummatous infiltration has extended most deeply into the tissues. Hence, where the point of largest deposit of gummy material is in the upper portion of the pharynx we have interference with function, and deformity, without necessarily involving an obstruction to the passage of the food. If, on the other hand, the original deposit is low down in the pharynx, the subsequent cicatrization results in a narrowing of the orifice of the œsophagus, the two sides of the pharynx being drawn together, as it were, dragging with them the lateral walls of the pharynx and the parts in front. If in addition to this the ulceration has extended to the two pillars of the fauces, and they become adherent, the cicatricial contraction drags the tongue backward and downward, thus increasing the stenosis, and giving rise not only to obstruction in deglutition, but occasionally to dyspnœa.

Interesting cases of this sort have been observed by Gerhardt, Langreuter, Trendelenberg,[4] Schroetter,[5] Caht,[6] Tobold,[7] Bruze-

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[1] Loc. cit.
[2] Loc. cit.
[3] Virchow's Archiv, vol. xxi., p. 40.
[4] Arch. für klin. Chir., vol. xiii., p. 372.
[5] Jahresber. der Klin. f. Laryngoskopie, 1870, p. 66.
[6] Deutsche Klin., vol. xxvi., p. 206.
[7] Wien. med. Presse, vol. xvi., p. 395.

ius,[1] Hayden,[2] Smith,[3] Sokolowski,[4] Hofmokl,[5] Pauly,[6] Lipp,[7] Fraenkel,[8] Lublinski,[9] and Schech.[10]

Where the original deposit with ulceration occurs in the soft palate and pillars and extends to the base of the tongue, we have a circular contraction, as it were, occurring at the isthmus, which may draw the tongue upward toward the palate, while at the same time the pillars are drawn inward, thus leaving a mere rounded opening at the entrance of the pharynx, interfering with deglutition but not necessarily with the entrance of air to the lungs. This was the condition in the cases reported by Zimmer,[11] Fiedler,[12] Wist,[13] and Paul.[14]

In no case so far as I know has the gummy tumor or the subsequent ulcerative process extended by continuity of tissue into the œsophagus; hence these pharyngeal strictures stop at the œsophageal orifice.

Treatment of Syphilis in the Fauces.

The Primary Lesion.—The main interest of the hard chancre in the fauces attaches to the question of diagnosis. When recognized, however, as we have already seen, the local ulcerative action is of a more active character than that usually met with in the penis. The control of this destructive process, therefore, becomes an indication for treatment. This consists in thoroughly cleansing the parts by means of a simple lotion, such as has already been given,[15] after which the surface of the ulcer should be coated with iodoform or europhen. This process should be repeated daily.

I doubt the efficacy of caustics such as nitrate of silver and nitric acid, or the acid nitrate of mercury, in controlling the progress of a syphilitic ulcer of any variety, and should not indorse their use for this purpose.

Few believe now, I take it, the old teaching that the destruction or excision of a hard chancre serves to prevent to any extent the entrance of the syphilitic virus into the circulation.

As we have already seen, in the very large majority of instances a hard chancre locates itself on a tonsil which is in a state of hypertrophy. The question of tonsillotomy, therefore, becomes

[1] Hygeia, vol. xxxvii., p. 12. [2] Dublin Quarterly Journal, 1869, vol. xlviii., p. 660.
[3] Med. Chir. Trans., vol. lxiii., p. 229. [4] Deutsche med. Woch., 1882, p. 426.
[5] Loc. cit. [6] Loc. cit.
[7] "Mittheilungen des Vereins der Aerzte in Steiermark," Graz, 1884.
[8] Internat. Cent. für Laryngol., Rhinol., etc., 1889–90, vol. vi., p. 366.
[9] Loc. cit. [10] Arch. für klin. Med., vol. xvii., p. 259.
[11] Inaug. Dis., Leipsic, 1868. [12] Arch. für Heilkunde, vol. xii., p. 212.
[13] Lancet, London, 1872. [14] Liverpool Medical and Chir. Journal, 1885, p. 474.
[15] Vol. i., p. 140.

one of interest. Certainly no controlling influence upon the evolution of symptoms can be expected from this measure; hence, I should seriously question the propriety of removing an enlarged tonsil, even if especially indicated from its size, while it is the seat of a primary sore.

Of course, while the local ulcer exists, a certain amount of attention should be directed to the character of the food taken, and the use of alcohol and tobacco interdicted.

Internal medication should be deferred until the diagnosis is fully established by the appearance of the eruption or other secondary manifestation.

The Erythema of the Pharynx.—The extent of the local inflammation in this manifestation of syphilis is of an exceedingly trivial character, and rarely gives rise to any local symptoms. When such are present, they are those of an ordinary catarrhal pharyngitis, and should be treated practically by the same methods as a non-specific inflammation.

The Mucous Patch.—When a mucous patch makes its appearance in the fauces, the case should be watched with the greatest care and the treatment followed up faithfully and with perseverance, for we have here to deal with one of the most persistent of lesions, and furthermore one in which there is a decided tendency to extension, not only by a continuity of tissue, but by the development of new patches. Furthermore, as has been already stated, I am disposed to think that if not actively combatted it shows a disposition to become a chronic local affection of the faucial mucous membrane.

The main indication for treatment consists in the thorough destruction of the patch by the application of some efficient caustic agent; and of these, I take it, there is none better than nitrate of silver, either in the solid stick or saturated solution. This is to be carefully applied until each individual patch is thoroughly saturated with the caustic. Furthermore, I think the applications should be made daily, or at least every alternate day, until the morbid process is observed to be thoroughly under control.

It is scarcely necessary to add that the inspection of the fauces should be made with a thoroughly good illumination, in that the mucous patch on the tonsil or pharyngeal wall might otherwise be overlooked.

In addition to this, the use of alcohol, and especially tobacco, should be strictly interdicted, while at the same time the patient should be directed to avoid the use of all condiments, highly spiced food, etc. If the patches spread over a considerable area and give rise to much pain in deglutition, relief may be afforded by the

local application of cocaine, a four-per-cent solution of which may be placed in the hands of the patient. In addition to this, a certain amount of relief may be afforded by the frequent use of a gargle and mouth wash as follows:

℞ Acidi boraci, ... ℥ ij.
Glycerini, ... ℥ ij.
Tinct. myrrhæ, ... ℥ i.
Aquæ rosæ, ... ad ℥ viij.
M.

℞ Sodii biborat., ... ℥ iss.
Sodii bicarb., ... gr. xxx.
Thymol, ... gr. iij.
Glycerini, ... ℥ i.
Aquæ laurocerasi, ... ad ℥ iv.
M.

The Superficial Ulcer.—Both the local and general treatment of this manifestation of syphilis in the fauces is identical with that already given in discussing the treatment of a similar lesion in the nose.[1]

The Gummy Tumor.—The only difference between a gummy tumor in the fauces and that of the nose is that in the former situation it runs a much more rapid course, the tissue soon breaking down and giving rise to the deep ulcer. On account of its location in the fauces, however, it may give rise to prominent symptoms.

This, however, does not involve any special indications for local treatment, in that this is absolutely without avail. The only method by which the tumor can be dissipated is by the internal administration of the iodides, in the manner already discussed in connection with gummatous tumor of the nose.[2]

The Deep Ulcer.—This lesion of syphilis, as involving the nasal cavity, as we have already found, is usually attended with bony necrosis, which markedly complicates its clinical history. In the fauces, however, bony necrosis does not occur, except in those rare instances in which there is an unusually deep gummatous infiltration in the posterior wall of the pharynx, involving the periosteum of the vertebral bodies. As a rule, then, we have to deal with an ulceration confining itself entirely to the soft parts. Its treatment, however, is practically identical with that of a similar condition in the nasal cavity,[3] and consists in the early administration of full doses of the iodide of potassium, together with the local application of iodoform or europhen after the surface of the ulcer has been thoroughly cleansed.

[1] See vol. i., p. 352. [2] See vol. i., p. 353. [3] See vol. i., p. 55.

The internal administration of the iodides I regard as of far more importance than the local treatment, in that, as already stated, I do not believe that the deep ulcer practically extends by a new deposit of gummatous material, but cases not infrequently come under observation in which the whole of the gummatous material which has been deposited in the tissues has not broken down into the ulcerative process, and hence the internal administration of the iodides arrests any further destruction of tissue, by inducing an absorption of that portion of the gummatous material which has not become ulcerated.

Cicatricial Deformities.—By far the most common deformity with which we are called upon to deal in this region is that in which the soft palate is adherent to the pharyngeal wall. This, as we have seen, may be complete or incomplete. Practically, however, this makes no difference in the treatment, as the two conditions are identical.

The division of the adhesion, ordinarily, is a somewhat simple matter; the great difficulty which is met with is in maintaining the artificial opening after it has been made. Dieffenbach,[1] after making his incision, passed a strip of linen through the nose, and allowed it to fall below the free border of the palate. He also advised turning the cut surface backward on itself, to still further prevent adhesion. Dzondi[2] packed the opening with charpie. Hoppe[3] resorted to the same device.

In all these instances the operations failed to accomplish any good result, on account of the readhesion and contraction. To prevent this, Cook[4] resorted to the device of constructing a quadrilateral lead plate, which, after severing the attachments, he suspended in the pharynx, by means of threads passed through the nose. This was worn six weeks, and the device is said to have been successful. Kuhn,[5] for the same purpose, used a gutta-percha plate. Somewhat similar to this was the very ingenious device of Verneuil,[6] who, after making his incision, suspended in the pharynx a series of drainage tubes, strung on a thread, which was passed through the nose, one object of the tubes being to permit of the passage of air. The result was only partially successful, and under Verneuil's direction this patient subsequently dilated the opening daily by means of a small rubber bag, acting on the principle of Barnes' uterine dilators. This procedure was successful while the dilatation was persisted in. Recognizing the fact that these adhe-

[1] "Operat. Chir.," vol. i. [2] Loc. cit.
[3] Loc. cit. [4] Loc. cit.
[5] Arch. für Ohrenheilk., 1879, vol. xiv., p. 165.
[6] Bull. de la Soc. de Chir. de Paris, 1876, vol. ii., p. 308.

sions re-form after cutting, unless permanently held apart, Championnière [1] had constructed a curved silver tube, which was passed from below upward, between the palate and pharynx, and held in place by arms which were attached to the third molars of the upper jaw. This device seems to have been worn with comfort, and to have answered an excellent purpose. Before resorting to his tube, Championnière had passed a rubber band into each nostril and round the palate, in order to maintain permanent traction. This, however, was without avail.

A. H. Smith,[2] acting on the theory that readhesion was the main difficulty in overcoming these deformities, after making his incision, cauterized the cut surface by means of monochloro-acetic acid, the idea being thus to establish a superficial slough which would maintain itself in position for sufficient time to allow the edges to granulate beneath. I think experience teaches us that in most cases recontraction is the most serious difficulty with which we have to contend. While, therefore, Smith's device is a most ingenious one, and was attended with success in the case reported, it is scarcely available where there is a large amount of cicatricial tissue. As avoiding this latter condition, Ried [3] and Coulson [4] attempted to dissect out the cicatrix. The necessary result, however, of such a procedure is merely a re-formation of the same tissue.

The exceeding great deformity which characterizes these cases, together with the difficulty in dealing with them by ordinary procedures, naturally suggests the resort to some plastic operation as promising a successful result. One of the most ingenious of these was that carried out by Lesser [5] in a case in which the soft palate was adherent to the posterior pharyngeal wall, with the exception of a small portion in the median line. The portion of the palate not adherent to the pharyngeal wall was split into two plates, and the anterior of these divided in the median line by a longitudinal incision. The freshened surface of the posterior plate was then united to the angle between the two anterior flaps which had been formed by the preceding longitudinal incision. The adhesions between the velum and the posterior pharyngeal wall on either side were then divided, and each anterior flap was folded backward and upward over the raw surface thus formed, and sutured in this position. In this way the healthy mucous membrane covering the anterior face of the palate was made to face the raw surface on the posterior pharyngeal wall, and readhesion was thus prevented. In other words, Lesser, preserving that portion of the palate which

[1] Loc. cit. [2] Trans. of the Am. Laryng. Ass'n, 1885, p. 183.
[3] Jen. Zeitschrift für Med. und Naturw., 1864. [4] Loc. cit.
[5] Cited by Rice, Loc. cit., p. 113.

was not adherent, turns the adherent portion about, in such a way as to form a palate whose healthy membrane faces the pharynx, while the raw surface of the pharynx presents anteriorly. It should be stated that this procedure was really a modification of one suggested by Dieffenbach.[1]

While devices of this sort may be available in special cases, I think, as a rule, experience teaches us that a stricture here follows the same general law as stricture elsewhere, and demands constant attention to preserve a sufficient degree of patency for ordinary functional purposes. The ordinary rule of procedure, then, will be to separate the adhesions as far as possible by means of a properly curved or angular knife, after which the artificial opening is maintained by the daily introduction of such dilating instruments as may be best adapted for the individual case. In many cases where the opening already exists, the whole treatment may consist in the use of dilating instruments, gradually increasing their size. As good an instrument, perhaps, as we possess for dilating purposes is the ordinary flexible œsophageal bougie, which may be passed from above downward through the nose, or inserted through the mouth. The patients easily acquire sufficient dexterity to carry out this manipulation successfully.

In a case recently under my own observation, in which there was also nasal syphilis, requiring the use of the douche, I directed the patient to syringe the nasal cavities three times a day with the post-nasal syringe,[2] and at the same time to exercise a certain amount of traction on the palate with the nozzle of the syringe. At the commencement of treatment, the nozzle of the syringe could only pass through the opening with the exercise of considerable force. After two months of this manipulation, the opening measured about three-quarters of an inch.

In those cases in which the stricture develops high up, viz., between the base of the tongue, anterior pillars, and hard palate, our main resource consists in continuous dilatation, in connection with direct incision of the cicatricial bands. As far as I know, no plastic operation has ever been attempted in this region, nor does it seem available. The same method of treatment also is pursued where the stenosis develops in the lower part of the pharynx.

In incising the cicatricial bands in the lower part of the pharynx, of course, it would be necessary to make use of the laryngeal mirror, and to operate by means of an angular knife. Where the stenosis is of such a character as to notably interfere with respiration, tracheotomy would be demanded, and should, as a rule, be promptly performed as soon as the indications are present.

[1] Loc. cit.

[2] Fig. 32, vol. i.

CHAPTER XVIII.

TUBERCULOSIS OF THE FAUCES.

It would seem that a deposit of miliary tubercle in the mucous membrane of the respiratory apparatus assumes a peculiar virulence according as the seat of the deposit is in portions near to the outer world. Furthermore, the frequency with which these tubercular deposits occur seems to be governed by the same rule. In other words, while pulmonary tuberculosis is responsible for something over one-seventh of the annual death-rate among civilized nations, tuberculosis of the larynx is still less frequently met with, and tubercular deposit in the buccal cavity is among the exceedingly rare manifestations of this fatal disease.

Thus, according to Williglk,[1] in 1,317 autopsies in tuberculous cases, the larynx was affected 237 times, while the deposit was found in the pharyngeal membrane in but a single instance. Louis,[2] in 1825, found 4 cases of buccal ulceration in 120 phthisical patients. Guttmann[3] makes the statement that the disease occurs in not more than one per cent of tuberculous patients; while Lublinski[4] found only two or three cases in 16,000 patients. Virchow, according to Fraenkel,[5] found only 1 case of pharyngeal ulceration in 150 cases of phthisis or tuberculosis. Abercrombie[6] found that at the Hospital for Sick Children the autopsies for twenty-five years on 380 cases of tuberculosis furnished 8 cases in which there were tubercular manifestations in the pharynx. Boecker and Schoetz[7] met with 20 cases of pharyngeal tuberculosis out of 2,950 cases of throat disease. Tauber[8] states that out of 6,500 laryngeal and pharyngeal patients, 13 cases suffered from tuberculosis of the pharynx.

While, therefore, we find the frequency with which tuberculosis occurs diminishing in a very marked way as we approach the outer

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[1] Prager Vierteljahrschrift, 1856, vol. xiii., pt. 2, p. 10.
[2] Récherches sur la Phthisie, Paris, 1825. [3] Deut. med. Woch., 1883, p. 305.
[4] Deut. med. Woch., 1885, vol. xi., p. 136.
[5] Berl. klin. Woch., 1876, vol. xiii., p. 659.
[6] Medico-Chir. Trans., 1887, vol. lxx., p. 101.
[7] Verhandl. d. Berl. med. Gesellsch. (1883–84), 1885, vol. xv., pt. i., pp. 147–150.
[8] Journal of Laryngol. and Rhinol., 1889, vol. iii., p. 11.

world, it is also a very noticeable fact that the severity of the disease increases, in that in the upper air-tract it usually runs a somewhat rapid course and is attended with symptoms of the most distressing character.

We find vague references to phthisical ulcerations of the fauces as far back as the time of Hippocrates.[1]

Louis[2] recognized them as intimately associated with pulmonary phthisis, as did also Green,[3] Bryk,[4] Wendt,[5] and Fox.[6]

Trélat,[7] however, first demonstrated the exsitence of miliary tubercle as the cause of the ulcerative process, citing in support of this teaching the microscopical examinations of Vulpian and Liouville. Subsequent and confirmatory observations were made by Gee,[8] Bucquoy,[9] Hanot,[10] Isambert,[11] Fraenkel,[12] Secchi,[13] Abercrombie and Gay,[14] Routier,[15] Gaucher,[16] Mackenzie,[17] Zawerthal,[18] Lennox Browne and Grant,[19] Millard,[20] Gougenheim,[21] Cadier,[22] Kidd,[23] Krause,[24] De Blois,[25] Abraham,[26] Hinkel,[27] and Lublinski.[28]

ETIOLOGY.—The primary cause of faucial tuberculosis is the same as that of pulmonary or general tuberculosis. This subject, however, need not be entered upon in the present consideration.

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[1] "Epidem.," i., § 1, cap. 2; also iii., § 82, case 6. [2] Loc. cit.

[3] "Practical Treatise on Pulmonary Tuberculosis," New York, 1864.

[4] Wien. med. Woch., 1864, vol. xiv., Nos. 42, 44.

[5] Archiv für Heilkunde, vol. xi., p. 566.

[6] St. George's Hos. Reports, 1869, vol. iv.

[7] Mémoire de l'Acad. de Méd., Nov. 27th, 1869.

[8] St. Bart.'s Hos. Reports, 1871, vol. vii., p. 141; Ibid., 1875, vol. xi., p. 41.

[9] La France Méd., 1874, vol. xxi., p. 289. Gaz. des Hôp., 1878, vol. li., pp. 449 and 465.

[10] Bull. de la Soc. anat. de Paris, 1874, vol. xlix., pp. 336 and 340.

[11] Annal. des Mal. de l'Oreille, 1875, vol. i., p. 77; Ibid., vol. ii., p. 162.

[12] Berl. klin. Woch., 1876, vol. xiii., pp. 657 and 678. Med. Record, London, Jan. 15th, Feb. 15th, 1877.

[13] Berl. klin. Woch., 1877, vol. xiv., p. 376.

[14] Med. Chir. Trans., London, 1877, vol. lxx., p. 93.

[15] La France Méd., 1879, pp. 113 and 122.

[16] Prog. Méd., 1879, vol. vii., p. 445.

[17] "Diseases of the Throat and Nose," Am. ed., Philadelphia, 1880, vol. i., p. 110.

[18] Wien. med. Presse, 1880, vol. xxi., pp. 1297 and 1365.

[19] Archives of Laryngol., 1881, vol. ii., p. 1.

[20] Union Méd., Paris, 1881, 3d series, vol. xxxiii., pp. 25 and 302.

[21] Union Méd., Paris, 1882, 3d series, vol. xxxiv., p. 736.

[22] Annal. des Mal. de l'Oreille, 1883, vol. ix., p. 136.

[23] Trans. of the Path. Soc. of London, 1883 and 1884, vol. xxxv., p. 189.

[24] Berl. klin. Woch., 1884, vol. xxi., p. 170.

[25] Boston Med. and Surg. Journ., 1885, vol. cxiii., p. 392; also Transactions of the Am. Laryngol. Ass'n, 1884, p. 99.

[26] Trans. of the Acad. Med. of Ireland, 1885, vol. iii., p. 358.

[27] Medical Press of Western New York, Buffalo, 1885 and 1886, vol. i., p. 354; also Trans. of the Med. Soc. of New York, Syracuse, 1886, p. 514.

[28] Brit. Med. Journ., 1887, vol. ii, p. 456.

The active cause of the tubercular manifestation in this region, undoubtedly, in the very large majority of instances, lies in a previously existing involvement of the pulmonary tissues. It has always been a subject of discussion, in connection with laryngeal phthisis, as to whether the primary deposit may occur in this region before the lungs are involved. The same question, of course, arises in connection with the pharyngeal affection. Cases have been reported by Isambert,[1] Gougenheim,[2] and Abraham [3] of tubercular disease in the fauces in which at the onset of the attack, no morbid condition of the lungs could be detected. The inference, of course, is that the pharyngeal deposit was primary. It is contended, on the other hand, that the pulmonary disease existed, but could not be recognized by physical signs. Abraham's case was one of enlarged tonsils, which, upon removal, showed evidence of tuberculous tissue. Gougenheim's case was one of faucial ulceration, which was cured by local applications of iodoform. Isambert suspected the existence of pulmonary disease, although he could not recognize it in his case, a child of four and one-half years of age.

The question, from a practical point of view, is not important, I think. That we may have a primary deposit of tubercle in the fauces, I think, should not be questioned. Primary tuberculosis may occur in any region or organ of the body; there is no reason whatever why it should not occur in the fauces.

From a clinical point of view, however, I think it is exceedingly probable that coincident with the faucial deposit there occurs a pulmonary infiltration. A number of these cases have come under my own observation. In one reported [4] it seemed to be pretty clearly evident that the miliary deposit occurred in the pharynx, larynx, and lungs at about the same time. There was no autopsy in this case. The symptoms, however, pointed toward a general tuberculosis. The clinical history, furthermore, of the large majority of the cases reported is of a similar character.

I think, then, we are justified in regarding faucial tuberculosis as a manifestation of acute miliary tuberculosis, the deposit occurring simultaneously in the pharynx, larynx, and lungs, together with the intestines and other portions of the body. Hence, a tubercular ulceration in the pharynx or fauces, I think, should, as a rule, be accepted as evidence of general tuberculosis, the fact of the general systemic involvement being evidenced at the onset of the disease only by the marked constitutional symptoms, which, as will be seen later, are of a somewhat aggravated character. Furthermore, if physical signs give no evidence of involvement of other

[1] Loc. cit. [2] Loc. cit. [3] Loc. cit.
[4] Trans. Am. Laryngol. Ass'n, 1879, p. 267.

organs at the onset, these manifest themselves so soon after the recognition of the faucial disease as to warrant the conclusion that a tubercular infiltration has occurred simultaneously or immediately following the deposit in the tissues of the fauces.

In the majority of instances the disease sets in in the course of a chronic pulmonary tuberculosis.

In Abercrombie's and one of Gee's cases it probably ensued upon a tubercular enteritis. It is interesting to note that both these latter cases occurred in children aged six to seven.

In 41 cases which I have been able to consult, 15 occurred in females and 23 in males; in 3 the sex is not given. Of these, 6 occurred in the first decade of life, 4 in the second, 11 in the third, 10 in the fourth, 2 in the fifth, 1 in the sixth, and 1 in the seventh.

The oldest case developed at sixty-three, while the youngest was three and one-half.

While a question, perhaps, of no great practical importance, it has always been a subject of more or less discussion as to why tubercular ulcerations develop in the throat. The old teaching of Louis, that they were due to the local action of the sputa from the diseased lungs giving rise to a catarrhal ulceration which subsequently became tubercular, is now generally abandoned. Lublinski[1] and others are of the opinion that the faucial ulcerations are due to auto-inoculation by the bacilli whose source is in the pulmonary disease. This theory is scarcely tenable, for, as Zawerthal[2] argues, in this case the tubercular process would naturally be superficial, whereas as a matter of fact the deeper tissues are more infiltrated as a rule.

Five cases of this disease have come under my own observation.

In two of them it was exceedingly interesting to watch the new deposit of tubercle, which could be clearly seen making its appearance in small grayish-white nodules beneath the superficial layer of the mucous membrane, in such a way as to demonstrate conclusively to my own mind that the tubercular deposit occurred before the erosion or ulcerative process. These minute nodules, furthermore, were easily identified and their clinical history traced, as in the course of from three to five days they broke down and showed ulcerative action.

Strassmann's[3] investigations possess a peculiar interest in this connection. He made a careful examination of the tonsils in 21 cases of tuberculosis: in 15 of these cases the tubercular process involved the lungs; out of these 15 cases of pulmonary disease 13 showed tubercular deposits in the tonsils. In 6 cases of tuberculo-

[1] Loc. cit. [2] Wien. med. Presse, 1880, vol. xxi., pp. 1,297 and 1,365.
[3] Virchow's Archiv, 1884, vol. xcvi., p. 319.

sis the lungs were not involved, and in all these cases the tonsils were not tubercular; although subsequently 2 developed pulmonary disease. In the 13 cases of tuberculosis of the tonsil the source of the trouble was undoubtedly in auto-inoculation from the pulmonary discharges. The possibility of this is therefore proven as regards the tonsil. The entanglement of tubercle bacilli here, I take it, was largely mechanical. The tubercular process, however, in these organs in all cases remained latent, no ulcerative action developing. This lends notable weight to the assertion already made that tubercular ulceration in the fauces is a manifestation of acute tuberculosis, and not of the chronic form of the disease.

In view of the later pathological researches, we are compelled to recognize the fact that tubercular disease is to an extent contagious; but when we subject this teaching to rigid clinical investigation, we must necessarily regard the danger of actual contagion as an exceedingly remote one. Of the cases above cited, the only one which lends support to this view is that of Hinkel, which was possibly contracted from a brother suffering in a similar manner.

PATHOLOGY.—The pathological changes which characterize this disease in the fauces differ in no essential degree from tubercular processes in other portions of the air tract. The essential lesion consists in an infiltration of the tissue with embryonic or small round cells, which primarily invade the connective-tissue elements, and subsequently infiltrate the walls of the blood-vessels, thus obliterating their calibre. The round cells also invade the muciparous glands, attacking the connective-tissue framework without necessarily destroying the epithelium. The grouping of these cells is the same as that which characterizes tubercular processes elsewhere.

The frequency with which segmentation of the nuclei is observed is to be taken as evidence of the rapidity of cell proliferation. The same explanation, perhaps, may be accepted for the existence of the large amount of granular matter which is observed, the result of cell decay. These are practically the views taken by Hanot.[1] Cornil[2] goes still further in demonstrating an infiltration of the glandular epithelium by the gray granules. The starting-point of the infiltration is in the connective tissue of the mucosa, the subsequent extension being in the main outward toward the surface.

According to Mackenzie,[3] the muscular fibres underlying the

[1] Bull. de la Soc. anat., 1874, vol. xlix., p. 336.

[2] Journ. des Connaissances médicales, July 13th, 1875, p. 193. Cited by Isambert: Annales des Mal. de l'Oreille, 1876, vol. ii., p. 164.

[3] Op. cit., p. 111.

mucous membrane are also invaded. This, however, was not found in the cases examined by Hanot.

Of course the existence of the bacillus is recognized as an invariable accompaniment of a tubercular process. The primary deposit in the majority of instances occurs in the velum in the shape of minute gray nodules, showing through the surface and causing slight grayish-white projections—the tubercular nodule. These break down and form minute points of ulceration whose edges extend and join with their fellows, forming broad surfaces of diseased action. The extension of the disease is lateral to the pillars of the fauces and toward the pharyngeal walls. When the pharynx is the primary seat of deposit, I think the ulceration shows a certain amount of hesitancy in ascending to the soft palate and pillars above. The ulcerative action commencing in the tonsil is very rare, and furthermore these tissues are not readily involved in the morbid process commencing elsewhere.

In probably the large majority of cases the larynx is invaded by the tubercular disease, if not coincident with, certainly very soon after, the faucial tissues are attacked; although this is not always recognized from a clinical point of view, in that the symptoms to which the faucial ulceration gives rise, to an extent mask the development of the laryngeal disease.

SYMPTOMATOLOGY.—The onset of the attack is marked by the symptoms of ordinary sore throat; there is a sharp, lancinating pain in the fauces, aggravated on deglutition; the parts feel sore and stiff, while at the same time the patient experiences a feeling of general malaise, with chilly sensations, or there may be a well-developed chill. Very early in the attack the thermometer shows a temperature of from 102° to 104°, with the evening exacerbation characteristic of hectic fever. These symptoms may persist without much change for several days, or the development of the disease may be very rapid, the ulcerative process setting in and the local symptoms becoming notably aggravated. Deglutition becomes not only more painful, but is accomplished with considerable difficulty. The infiltration of the palate destroys its contractility in such a way that food and drink pass into the nasal cavities: at the same time the general symptoms develop, the hectic sets in, the fever becomes more persistent, and there is progressive loss of flesh, both as a result of the constitutional disturbance and the difficulty of taking nourishment. The movements of the palate in the act of deglutition being thus hampered, the mucous and mucopurulent secretions from the ulcers accumulate in the fauces, and are expelled with great effort, increasing the distress of the patient, who makes ineffectual attempts at clearing the parts by a feeble

effort of hawking. The voice is thick and muffled, and articulation becomes difficult owing to the immobility of the fauces. The tone of the voice is not notably impaired unless the larynx is invaded. Cough is somewhat persistent, feeble, and ineffectual. The secretions from the ulcer are thick and exceedingly tenacious, adhering closely to the parts. These inspissated plugs, as it were, stretching from one side of the faucial bridge to the other, give rise to obstruction to breathing, and also to a sort of gurgling noise on inspiration.

After the faucial ulcerations are fully developed, these cases present a picture of suffering and distress that is pitiable in the extreme. This is especially true in those instances in which the disease develops in a patient already wasted and exhausted by a long-continued chronic tubercular disease of the lungs.

Practically, then, we find that the general symptoms are those of acute miliary tuberculosis in connection with the local symptoms due to the ulceration in the throat.

In rare instances we find tuberculosis in the fauces occurring in connection with chronic tuberculosis. Strassmann's cases of non-ulcerative tubercular disease of the tonsil must be placed in this category, as also Secchi's, Lennox Browne's, and one of Isambert's cases. In these instances we find the same localized symptoms in the fauces, but not the marked systemic disturbance which characterizes acute miliary tuberculosis. These cases run a much slower course, and the clinical history, aside from the locality of the ulceration, is mainly that of tubercular laryngitis.

DIAGNOSIS.—Von Ziemssen,[1] in the discussion of laryngeal phthisis, makes the assertion that neither the catarrh nor the ulceration of phthisical subjects presents any characteristic signs by which it can be recognized as such—a view which seems to have been adopted by Vivian Poore,[2] Cohen,[3] and others. Notwithstanding this, I believe that phthisical ulceration, whether observed in the larynx or fauces, presents certain features which are so characteristic of this form of disease that, practically, a diagnosis should not present any very great difficulties, especially when, as is the case in the fauces, the ulcerative process can be brought under direct ocular inspection.

In the fauces two stages of the disease may be recognized: first, the stage of primary deposit, and, second, the stage of fully developed ulcerative action. In the first stage there can be observed minute grayish-white spots, about the size of a mustard-seed,

[1] "Cyclopædia of Medicine," Am. ed., vol. vii., p. 848.
[2] Lancet, London, July 17th, 1880, p. 83.
[3] "Diseases of the Throat and Nasal Passages," New York, 1879, p. 512.

making their appearance somewhat suddenly in the deeper layers of the mucous membrane, producing a slight elevation above the normal surface. These constitute tubercular nodules, and when first deposited each nodule is entirely separate from its fellow. The tubercle undoubtedly occurs somewhat diffusely through the mucosa proper, yet makes its appearance on the surface, as shown by these nodules, at points where the infiltration aggregates itself, possibly about the orifices of the glands, or perhaps at the apices of the papillæ. In connection with the appearance of these small nodules, the mucous membrane itself is slightly swollen, while at the same time there is a diminution of vascular supply. In other words, the membrane presents a somewhat duller aspect, while the secretion on its surface is diminished, owing undoubtedly to the interference with the normal function of the glands. These nodules, before ulceration occurs, resemble somewhat closely the appearances which are present in an attack of croupous tonsillitis. The spots, however, are of a grayish, somewhat muddy color, in contradistinction to the pearly clear white of croupous exudation, and furthermore a close inspection shows that the mucous membrane is intact and the white spots show through the translucent superficial layer of the membrane that covers them.

In the second stage these small nodules, having persisted for from one to three days, break down into a localized necrosis, which results in the establishment of true ulcerative action. As the disease progresses we find the surface of these minute ulcers thus produced, spreading until, in the course of a short time, uniting with other points of diseased action, a broad ulcerative area is the result. This surface presents appearances which, as before stated, are characteristic of phthisical ulceration, and which I think should be recognized as such by direct inspection.

Practically, there is but one disease with which phthisical ulceration may be confused, and that is the superficial or deep ulceration of syphilis. After the tubercular ulceration sets in, the diminution of blood supply, already mentioned in connection with the first stage, is more marked, and hence the mucous membrane assumes a pallid gray, somewhat muddy color, with very little evidence of vascularity about it. The surface of the ulcer is of the same grayish tinge, and hence the margin of the ulcer is not recognized with perfect facility, except on close inspection. The surface of the ulcer is covered with thick, tenacious, grayish-white, ropy mucus or muco-pus, which extends beyond and adheres in inspissated masses to the intact mucous membrane. When this is cleansed, we find the surface of the ulcer presenting a somewhat granular appearance, slightly mottled in color, minute, pale, pink-

ish spots showing on its surface. Isambert likens this to the track of an earthworm in wet sand, Fraenkel likens it to cut bacon, while La Boulbene speaks of it as worm-eaten. The secretion from the surface is scanty, but, as before stated, thick and inspissated. The cell necrosis seems not to be very rapid, in that the secretion is ropy mucus, charged with such a limited number of necrotic cells as to render it scarcely opaque. The surface of the ulcer is level with that of the mucous membrane surrounding it, the margin not well marked, and the mucous membrane surrounding it presents no inflammatory areola.

The three appearances which I regard as important and somewhat pathognomonic are: the flush surface of the ulcer, the ropy mucous secretion, and the almost uniform color of the ulcerated surface and its surrounding membrane. In syphilis, on the other hand, we have a rapid destruction of tissue, in connection with active localized inflammatory action. Hence, the secretion from the syphilitic ulcer is largely purulent; it contains a certain amount of necrotic tissue, according to the rapidity of the ulcerative action. The ulcerated surface is notably hyperæmic, while the mucous membrane surrounding it shows a well-marked areola, according to the extent of the gummatous infiltration from which it originally resulted. In writing on this subject some years since[1] I tabulated these distinctive differences as follows:

Syphilitic Ulceration.	*Tubercular Ulceration.*
Deeply excavated.	No apparent excavation.
Bright red, angry-looking areola.	No areola.
Sharp-cut edges.	No well-defined or sharp-cut edges.
Bright yellow, purulent discharge.	Grayish, thick, semi-opaque mucous discharge.
Free and copious discharge.	Discharge small in amount.
Rapidly destructive.	Erodes slowly.
Extends deeply.	Extends laterally.
No general dyscrasia.	Marked constitutional disturbance.
No fever.	High fever.

In addition to this as a diagnostic aid, we have the systemic cachexia, which in phthisis is always well marked and usually absent in syphilis.

Lupus in the fauces could scarcely be confounded with this form of tubercular disease, in that it is essentially a chronic process attended with no marked cachexia or any prominent local symp-

[1] Trans. of the Am. Laryngol. Ass'n, vol. i., p. 267.

tom. The membrane is swollen by the lupus nodules, the isthmus of the fauces is notably distorted, and in connection with the ulcerative action there is also a certain amount of vigorous cicatrization, which latter is almost entirely absent in tubercular ulceration.

Of course, in every case where there is any possible doubt of diagnosis the secretions from the ulcerated surface should be examined for the presence of tubercular bacilli.

COURSE AND PROGNOSIS.—As before suggested, I think we must regard tubercular disease of the fauces, in the majority of instances, as a local manifestation of general tuberculosis, in which case it will necessarily result in a fatal termination in the course of a very few months. Where it occurs in connection with chronic pulmonary disease, the prognosis is almost equally grave, although the fatal termination is postponed somewhat. In this connection we consider it largely as a grave complication of the pulmonary disease, and one which adds notably to the suffering of the patient.

Confining ourselves, then, to the consideration of the local disease in the fauces, the question arises whether this is amenable to treatment. If, in a given case of pulmonary tuberculosis with faucial ulceration, the latter complication is cured, and the patient subsequently dies of the pulmonary disease, I think it is a justifiable assertion to state that the pharyngeal tuberculosis was cured. Gougenheim [1] reports the case of a woman of twenty-five with an extensive ulceration of the soft palate and uvula, which was entirely cured by the regular application of iodoform and ether. The uvula was amputated and showed tubercular tissue, although there is no report of the tubercle bacillus having been found. There was no pulmonary disease, and the recovery is reported as permanent. Lennox Browne [2] reports an instance in which a small ulceration appeared on the tonsil in a patient suffering with pulmonary and laryngeal phthisis. It disappeared after a single application of the galvano-cautery. Heryng [3] reports three cases of faucial tuberculosis occurring in adult life, in which the disease was a complication of pulmonary phthisis. The larynx was ultimately invaded in all these cases. The tubercular ulcer was small and circumscribed, and was located on the pharyngeal wall. It was entirely cured by Heryng's method of curetting, and subsequently rubbing in lactic acid.

We must accept, therefore, the teaching that in certain instances the small tubercular ulcers in the pharynx which occur in connection with pulmonary disease may be amenable to treatment.

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[1] Loc. cit.

[2] "The Nose and Throat and their Diseases," London, 1890, p. 214.

[3] "Die Heilbarkeit der Larynx-Phthise," Stuttgart, 1887, pp. 57 and 64.

In those cases in which the localized process is extensive in character, the prognosis is essentially unfavorable as regards even an amount of amelioration to the local morbid action. In two of Gee's and three of Abercrombie's cases the disease attacked children of from three and one-half to eight years of age. In these instances the fatal termination occurred in from two to eight weeks after the first manifestation of the faucial disease. The majority of the cases occurred in adult life. In those in which the disease complicated recognized acute miliary tuberculosis, the fatal termination ensued upon the pharyngeal manifestation in periods varying from two to four months; while in those cases which simply complicated pulmonary phthisis the duration of life after the occurrence of the faucial deposit rarely exceeded six months, except those cases, already mentioned, in which the faucial disease was cured.

TREATMENT.—Up to within comparatively recent years, practically the treatment of all forms of ulcerative action, including tubercular, syphilitic, and others, confined itself mainly to the use of caustics, especially the solid stick of nitrate of silver. If these measures act in any manner to retard the progress of the tubercular ulcer, the effect is quite ephemeral, and in many cases certainly their action is unfavorable, seeming to increase the activity of the process. Moreover, such applications are exceedingly painful and distressing to the patient.

The natural reaction which followed the abandonment of the use of caustics led to an entirely opposite mode of treatment, which confined itself to the use of mild palliative and soothing remedies. These consisted mainly in the application of certain cleansing lotions to remove the mucous accumulations on the surface of the ulcer, after which there were applied mild, unirritating astringents, sedatives, and alteratives. The importance of this mild plan of treatment was first emphasized, so far as I know, in an article by the writer[1] on laryngeal phthisis, in which the success was shown by a series of reported cases.

The plan, definitely outlined, consisted of four steps, as follows: First, the thorough cleansing of the ulcerated surface; second, the application of a mild astringent; third, the application of an anodyne; and, fourth, the application of iodoform, for its specific action in controlling an ulcerative process. The cleansing is accomplished by the use of a carbolized alkaline solution. Dobell's solution[2] answers an excellent purpose. This is applied in all cases by means of an atomizer. The second step consists in the application of an astringent. In the order of preference these are:

[1] N. Y. Med. Record, 1879, vol. xv., pp. 459 and 484.

[2] Vol. i., p. 174.

Zinci sulphas,	. . . .	grains 5 to the oz.
Argenti nitras,	. . . .	" 3 "
Zinci chloridum,	. . . .	" 3 "

The third step consists in the application of morphine in powder or in the form of Magendie's solution. The fourth step consists in the application of iodoform. This latter should be applied by means of Ely's powder-blower.[1] By this means a smooth, even layer of the powder is dusted upon the surface. This plan of treatment should be repeated every second or third day; if the case is an aggravated one, daily applications will be required. The surfaces of these ulcers are exquisitely sensitive to the touch, hence the above plan of treatment is carried out in such a way that the diseased tissue is in no way impinged upon by instruments of any kind. The solutions are applied in a state of fine atomization, and the powders blown upon the surface.

We find recorded in literature various recommendations for the use of inhalations by means of the steam-atomizer or the ordinary inhaling apparatus which is used for volatilizing various medicinal preparations, such as oil of tar, iodine, creosote, benzoin, oil of eucalyptus, etc. I have never seen any advantage from the use of these measures in either pharyngeal or laryngeal tuberculosis; and furthermore I think as a rule that the steam or other hot applications are not well tolerated by a patient suffering in this way, in that it causes a certain amount of relaxation of tissues with increased secretion, as a result of which the local symptoms are liable to be to a certain extent aggravated. The pain in deglutition is always a very prominent feature of these cases; hence any measure which will enable a patient to swallow with comfort becomes of the utmost importance, as relieving suffering, and at the same time serving to increase the amount of nourishment that can be taken. The local application of morphine adds very much to the accomplishment of this, perhaps; but we possess no remedy which accomplishes this end with the certainty and facility of cocaine. As increasing its permanency of action somewhat, it is well to apply this suspended in one of the fluid petroleum oils. An excellent formula is the following:

℞ Cocainae hydrochloratis,	. . . .	gr. xx.
Morphinæ,	. . . . .	gr. ij.
Aquæ,	. . . . .	℥ ss.

Misce; ft. sol.

Adde

Ol. voschano (see Vol. I., p. 115),	. . .	℥ i.

[1] Vol. i., p. 29.

This may be used at the hands of the patient or an attendant several times during the day, as may be indicated.

While the above plan of treatment would seem to be largely palliative, yet I have seen in a number of instances, especially in laryngeal phthisis, notable results accomplished, not only in the retardation of the development of the local process, but in the marked improvement which occurs where the plan was faithfully and carefully carried out.

One of the most original plans of treatment, and one which certainly strikes us as somewhat daring, is that suggested by Schmidt.[1] He advises, where the parts are notably œdematous, that free and bold incisions be made directly through the tissues, in such a way as to allow the free escape of blood and serum. This practice, as I understand it, was confined mainly to the swollen arytenoids and epiglottis in laryngeal phthisis. It would seem to be quite a simple and feasible device in tubercular ulcers of the pharynx, in that they are brought more immediately under direct inspection. As a matter of clinical observation, however, we rarely meet with much swelling in faucial tuberculosis except in the pendulous portion of the velum.

I have never felt justified in resorting to Schmidt's scarifications, either in pharyngeal or laryngeal phthisis, and it seems to me a somewhat hazardous method, although he reports excellent results from his operations in the larynx in affording relief to the local symptoms. More than this, I believe, he does not claim.

Krause[2] has obtained excellent results in the treatment of tubercular ulcerations in the larynx by the application of lactic acid. The use of this remedy was suggested by the excellent results which Mosetig-Moorhöf[3] had obtained in the treatment of lupis vulgaris, caries fungosa, and superficial epithelioma. Krause's method consisted in rubbing the lactic acid thoroughly into the diseased surface by means of a cotton pledget, or by injecting it by means of a hypodermic syringe directly into the tissues. He commenced with a ten-per-cent solution, and gradually increased its strength if necessary up to eighty per cent, making daily applications until local necrosis occurred. Krause claims that lactic acid will only cause the sloughing of the diseased tissue, and that the healthy tissue is not acted upon by the acid.

It seems to me somewhat doubtful if this differentiating action of lactic acid in strong solutions can in all cases be relied upon.

Krause has reported a series of cases of laryngeal phthisis in

[1] Congrès Internat. de Laryngol., Milan, 1880. Annal. des Mal. de l'Oreille, 1882, vol. vii., p. 25.

[2] Berlin. klin. Woch., 1885, vol. xxii., p. 462. [3] Cent. für Chir., 1885, p. 193.

which this plan of treatment was followed either by cicatrization of the ulcer or by a marked improvement in the local condition. He reports no cases of faucial tuberculosis treated in this way. Heryng,[1] however, as we have seen, reports two cases of the pharyngeal disease treated by the lactic acid with entire success as far as the local conditions are concerned. Heryng's method differs from that of Krause in that the ulcerated surface is thoroughly curetted by means of a sharp spoon, thus removing as much of the diseased tissue as can be done in this manner, after which a strong solution of lactic acid is thoroughly rubbed into the tissues. In a third case by the same observer, an equally successful result followed the use of chloride of zinc in connection with lactic acid after the surface was curetted.

Heryng reports almost equally good results in the curette and lactic-acid treatment of laryngeal tuberculosis, having succeeded in obtaining complete cicatrization in eight out of twelve cases. All these patients died ultimately of the pulmonary disease, and yet the laryngeal manifestation remained cured for periods varying from two to seventeen months.

In another series of fifteen cases of laryngeal phthisis reported by Heryng, the treatment was by lactic acid alone, after Krause's method. Eleven of these were completely cured. The natural inference is that Heryng's curette does not add much to the success of the treatment, and that the remarkable results obtained were due entirely to the destructive action of the acid, in which we are compelled to recognize an agent which possesses peculiar powers in dealing with this most intractable disease, whether located in the pharynx or the larynx.

While, therefore, I am of the opinion that in most cases of tubercular ulceration the soothing and palliative plan of treatment outlined above will be demanded for the relief of local symptoms, I think we have not done our full duty to any patient suffering from this disease, without giving him the benefit of such relief as lactic acid may afford, together with a hope of complete relief to the local conditions. I do not think, therefore, that in resorting to the lactic acid we should abandon the other methods. The two methods are certainly not antagonistic, and I see no reason why in carrying out the milder course the more radical method with lactic acid should not be resorted to in those cases in which it can be used.

Rosenberg[2] reports a series of observations on 57 cases of laryngeal phthisis, of which 9 were cured by the use of menthol. He

[1] "Die Heilbarkeit der Larynx-Phthise," Stuttgart, 1887, p. 57.

[2] Therap. Monatsheft, 1888, Nos. 7 and 8. Deutsche med. Woch., 1887, p. 338.

uses a twenty-per-cent solution of this drug in olive oil, applying it to the ulcerated surface once or twice daily. The application is made by dropping a few drops on the diseased surface by means of a small syringe, or it may be applied with an atomizer. In addition to this, the patient is directed to inhale a few drops of the same solution volatilized by boiling water, repeated several times in the course of the day.

Knight [1] reports having made somewhat extensive use of Rosenberg's method, and, while reporting no cures, he finds it gives notable relief to the distressing symptoms of the disease.

Gougenheim's [2] case, already referred to, seems to have been cured by a saturated ethereal solution of iodoform. Ether is very irritating to the air passages; and while regarding iodoform as an exceedingly valuable application in these cases, I think it should always be used in the form of a dry powder.

A number of writers advocate the use of the galvano-cautery in phthisical ulcers. I quite agree with Isambert in regarding the use of caustics as highly objectionable, and of these I know of none more so than the electric cautery.

Browne [3] makes the somewhat curious statement that the galvano-cautery possesses healing and antiseptic properties beyond any other form of cautery. I have never been able to recognize anything more than a destructive potency in the cautery electrode, and certainly in tubercular disease I believe it capable of much harm.

There are certain other measures which are of importance, not so much for limiting the progress of the disease as for alleviating the distressing symptoms. These consist in the regulation of the character of the food and method by which it is taken. In addition to this, the use of the voice should be interdicted as far as possible, in that articulation involves a certain amount of movement of the muscles of the fauces, whereby the local morbid process may be aggravated, although a patient suffering with this disease naturally spares the faucial muscles in articulation as far as possible. The food should be soft and pultaceous in character, and such as will pass into the œsophagus with the least effort on the part of the voluntary muscles of deglutition. As a rule, of course, fluids pass into the stomach with the greatest ease, and yet where the palate and pharynx are both involved, liquids are liable to be forced into the nasal passages. In these cases, soft foods, such as soft-boiled eggs, raw oysters, custards, etc., pass down with more facility. The food, moreover, should combine the highest

[1] Jour. Amer. Med. Ass'n, 1890, vol. xiv., p. 89.
[2] Loc. cit.
[3] Op. cit., p. 220.

amount of nourishment with the least effort at deglutition. It is also of great importance that spices and high seasonings should be rigidly interdicted. Delavan[1] has devised a special apparatus for the artificial feeding of patients suffering from throat tuberculosis, which consists, practically, of a flexible tube of small calibre, which is inserted part-way into the œsophagus, after which fluids are forced in by means of a simple apparatus. If artificial feeding become necessary in these cases, the ordinary Thudichum nasal douche, properly fitted with an œsophageal tube, answers a good purpose. Wolfenden[2] reports a case in which a patient found great relief from painful deglutition in throat phthisis by lying on his stomach and drawing up fluids through a tube. In my experience, if the ulcerated surface be thoroughly cleansed by means of an alkaline spray and a five or ten per cent solution of cocaine thoroughly applied, it is rare to meet with a case of throat phthisis in which deglutition is not accomplished painlessly and effectively. This anæsthesia persists usually from ten to twelve minutes, and can be repeated as often as it is desirable to administer food, which in these cases usually should be five or six times daily.

The general treatment of tuberculosis does not demand full consideration in this connection. We hear much of the special efficacy of certain forms of hypophosphites, cod-liver-oil emulsions, coca wines, and other prepared drugs in the treatment of both pulmonary and throat consumption. I know of no drug which possesses special virtues in the constitutional treatment of either faucial or laryngeal tuberculosis. The constitutional treatment of throat consumption is practically the same as that of pulmonary consumption. These are so familiar to all that their discussion need not be entered upon here.

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[1] Trans. of the Am. Laryngol. Ass'n, 1884, p. 81.

[2] Jour. of Laryngol. and Rhinol., vol. i., p. 317.

CHAPTER XIX.

LUPUS OF THE FAUCES.

In former years lupus was regarded as a disease which, under its two forms of *lupus exedens* and *lupus non-exedens*, confined its ravages almost exclusively to the skin, except in those instances in which the morbid process invaded the nasal cavities by extension. The possibility of its developing primarily or independently in the air tract seems to have been overlooked, and those cases in which the cutaneous affection was accompanied by ulcerative disease of the fauces or larynx were regarded, especially by the French writers, as instances of strumous ulceration. Rayer[1] was one of the earliest to suggest that the morbid process in the skin and the mucous membrane of the fauces were identical in character—a view in which he was followed by Hamilton,[2] Cazenave,[3] Alibert, and Devergie,[4] although at a comparatively recent date we find such observers as Isambert,[5] Bazin,[6] Desnos,[7] Landrieux,[8] and Homolle[9] still regarding the disease in the fauces as a manifestation of the strumous diathesis.

The term "struma" is one which at the present time may be safely eliminated from medical literature, in that it describes no definite morbid condition. Probably the very large majority of cases which have been recorded as strumous ulceration were in reality instances of lupus, although perhaps a smaller number have been cases of either acquired or congenital syphilis. Lupus, then, is a term which we use to describe a morbid condition which, while in the large majority of cases it attacks the skin, may also invade, either primarily or secondarily, the mucous membrane of the nose, pharynx, or larynx.

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[1] "Traité des Maladies de la Peau," Paris, 1835, vol. ii., p. 195.
[2] Dublin Journal of Medical Sciences, November, 1845.
[3] "Traité des Mal. de la Peau et Syphilis," vol. iv., p. 171.
[4] "Maladies de la Peau," Paris, 1857, p. 635.
[5] Bull. de la Soc. méd. des Hôpit., 1871, p. 107.
[6] "Traité de la Scrofule."
[7] "Nouv. Dict. de Méd. et de Chir.," vol. ii., p. 45.
[8] Archiv gén. de Méd., 1874, vol. ii., p. 660.
[9] "Des Scrofulides graves de la Muqueuse bucco-pharyngienne."

ETIOLOGY.—It is difficult to assign any actively exciting cause for the disease. In certain cases of the skin affection, traumatism seems to have been the active cause of its primary development, and the disease of the air tract to have arisen secondarily to the cutaneous affection. In those rare instances in which the disease is primary in the fauces, no exciting cause can be suggested.

Heredity does not seem to influence the disease, although undoubtedly a constitutional condition which bears some relation to the tubercular diathesis plays an important part in its causation. It is a generally accepted teaching at the present day that the special morbid lesion which constitutes lupus is due to a tubercular deposit which is practically identical with that which gives rise to tubercular disease of other organs. In one case, however, the morbid process is an active one, while in lupus the morbid process which the tubercle excites is an exceedingly chronic or latent one.

In 79 cases in which lupus has invaded the air tract, which I have collated from medical literature, including those which have been under my own observation, 51 occurred in females, while but 18 occurred in male patients, the sex not being reported in the other instances. Why there should be this remarkable preponderance of cases among females it is impossible to say, for the pathology of the disease naturally suggests certain clinical relations with phthisis, whereas in the latter disease the large preponderance of cases occurs in males. Of the cases above collated, 2 occurred in the first decade of life, 24 in the second, 24 in the third, 8 in the fourth, 6 in the fifth, 1 in the sixth, and 1 in the seventh decade. In 13 the age was not reported.

We thus find the very large majority of cases occurring between the ages of ten and thirty. These statistics, however, give the ages which are recorded in the reports. In many of the cases, the disease had existed for periods varying from one to ten years, and even longer, so that we find the development of the disease occurring at a much earlier period of life in the majority of instances, probably originating in the second decade, while the skin affection in many cases developed much earlier. Thus, in several cases reported by Chiari and Rhiel[1] the cutaneous lupus in six instances developed between the ages of two and five. The latest age at which the disease is reported to have developed was in the case observed by Ramon de la Sota,[2] at fifty-nine, in which the disease confined itself to the pharynx and larynx, the skin not being affected.

As before stated, in the majority of cases the disease com-

[1] Vierteljahrschrift für Derm. und Syph., Vienna, 1882, p. 663.

[2] Trans. of the Am. Laryngol. Ass'n, 1886, p. 11.

mences in the integument, and subsequently, at periods varying from one to ten or twenty years, invades either the fauces by new centres of development, or the nasal cavities, by continuity of tissue. Where it extends to the fauces, it usually attacks the soft palate and pharynx first, and subsequently the larynx. Of the 79 cases above collated of lupus of the air passages, the pharynx, larynx, and skin were involved in 31; the larynx and skin in 19; the pharynx and larynx in 14; the pharynx and skin in 5; the larynx alone in 9; and the pharynx alone in a single instance. In most cases, the order of development was as before stated, the disease first developing in the skin, subsequently in the pharynx, and finally in the larynx. In one of Chiari and Rhiel's[1] cases, a male aged twenty-one, the cutaneous lupus developed in childhood, followed later in life by an invasion of the larynx, while the pharyngeal invasion occurred still later. Another case reported by the same observers was unique, in that the primary invasion of the disease occurred in the fauces at the junction of the hard and soft palates. This was a female aged fourteen. Secondary invasion of the larynx occurred.

A certain degree of relationship between lupus and tuberculosis seems to be clearly established, both from a clinical and pathological point of view; for while the two diseases appear to pursue a distinctly different course, they are coincident in the same individual in such a number of cases that this clinical relation must be accepted. This teaching, however, does not seem to be borne out by a study of the cases of lupus in the air tract, in that of these I find but one instance in which lupus of the throat occurred in a tubercular subject, viz., that reported by Thoma.[2] In a compilation, however, of 144 cases of cutaneous lupus, Bloch[3] found 114 instances in which tubercular disease of other organs either preceded or followed the skin affection. Raudnitz,[4] on the other hand, in a compilation of 209 cases of lupus of the skin finds but 2 instances of developed tubercular disease in other organs, although he traces a direct family history of tuberculosis in 21 of his cases, while a similar hereditary taint was probable in 9 others. Besnier[5] found in 38 cases 8 in which there was tubercular disease of other organs.

Thus, Bloch finds a tubercular taint in over 75 per cent of his cases, Raudnitz in 9 per cent, and Besnier in 20 per cent. It is not easy to harmonize these statements. It is probable, however, that Bloch has accepted, as evidence of tubercular disease, en-

[1] Loc. cit. [2] Virchow's Archiv, vol. lxv., p. 316.
[3] Vierteljahrschrift für Derm. und Syph., 1886, p. 201.
[4] Vierteljahrschrift für Derm. und Syph., 1882, p. 31.
[5] Annal. de Derm. et Syph., 1883, p. 377.

larged lymphatic glands, caries, and other manifestations which are usually grouped under the indefinite term struma.

While, therefore, the relation between the diseases seems clearly established from a clinical and pathological point of view, tubercular disease of the lungs or other organs cannot be regarded as standing in a very active causative relation to lupus in the air passages.

PATHOLOGY.—The opinion broached by Neisser[1] and Friedlander[2] in 1881 that lupus constituted a true tubercular process was very soon verified by the announcement of Koch[3] that he had discovered the presence of the tubercle bacillus in lupus nodules. This view was still further confirmed by the experiments of Schuller,[4] Doutrelepont,[5] Koch,[6] and others, who produced tuberculosis in the lower animals by inoculation of lupus tissue.

FIG. 31.—Lupus of the Soft Palate, Uvula, and Pharynx.

Koch[7] went still further, and produced pure cultures of tubercle bacilli from tissues invaded by lupus.

The most common point of invasion of the disease when it attacks the fauces is the soft palate or one of the pillars. It usually starts near the free edge. A very common point of origin is in the body of the uvula, as seen in Fig. 31.

After the primary invasion, it extends slowly to neighboring tissues, without reference to anatomical boundaries, in this respect differing notably, I think, from syphilitic disease. From the soft palate it extends to the pillars, involving the tonsils, and finally the posterior wall of the pharynx.

At the onset of the disease it seems to be one purely of infiltra-

[1] Ziemssen's "Handbook of Skin Diseases," Amer. ed., N. Y., 1885, p. 296.

[2] Sammlung klin. Vorträge, 1881, No. 31. [3] Berliner klin. Woch., 1882, No. 15.

[4] "Untersuchung über die Entstehung und Ursache der scrofulos. und tuberculos. Gelenkleid.," 1880.

[5] "Die Aetiologie des Lupus vulgaris:" Proceedings Internat. Congress, Copenhagen.

[6] "Mittheilungen aus dem kaiserlichen Gesundheitsamt," 1883, No. 2.

[7] Loc. cit.

tion, producing that peculiar nodular thickening of the parts by which their normal contour is destroyed. The uvula is transformed into a thick, lumpy, bulbous mass, while the thin border of the soft palate is converted into a broad, somewhat ragged-looking, cord-like margin.

In connection with the infiltration which takes place in the tissues of the palate and pillars, there soon sets in a process of ulceration, which results in a notable loss of tissue. The ulcerative process which characterizes lupus is an exceedingly peculiar one, and differs in a marked degree from every other form of ulcer. There is an enormous thickening of the part from the primary and progressive infiltration, together with a slowly progressive recession or fading away of tissue; and yet the secretion is exceedingly limited, there is no pus discharge, no cell proliferation, no detritus, no necrotic tissue, and on close inspection in many instances a true ulcerated surface is not easily detected. In fact, none of the appearances which we ordinarily regard as characteristic of ulcerative action are present.

This peculiarity may possibly be accounted for by the exceedingly chronic course of the disease, months and even years oftentimes being expended in the process of destruction of the soft palate and pillars.

There is also evident an apparently vigorous effort on the part of nature to repair the ravages of the disease, in that large bands of cicatricial tissue are prominently observable traversing the diseased surface. Their contraction serves in a notable degree to enhance the distortion to which the morbid process gives rise.

The diseased action is rarely symmetrical, being usually more active on one side than the other. The ultimate result is to produce a more or less complete destruction of the soft palate and uvula, while the two pillars are practically obliterated, and the remains of the palate are drawn down and adhere laterally to the posterior wall of the pharynx, being drawn to one side or the other, leaving a narrow opening into the naso-pharynx. Where the posterior wall of the pharynx is involved, the destruction of tissue is not so apparent as the distortion of the parts. The faucial arch is narrowed by contractions, and the smooth surface of the pharyngeal membrane replaced by small knob-like projections here and there, marked by small points or lines of ulcerative action, and traversed here and there by bands of connective tissue.

While the essential lesion in this disease is a tubercular infiltration identical with that which gives rise to tubercular disease of the lungs, and while it is produced by the same bacillus, the two diseases run an essentially different course. As before stated, a

certain clinical and pathological relation is established between lupus and tuberculosis. The former disease has been reported by many as a chronic and latent form of tuberculosis; thus, it would seem that lupus bears the same relation to chronic tuberculosis as chronic tuberculosis does to the acute form. And yet, while both lupus and tuberculosis may be coincident in the same individual, no case as far as I know has ever been observed in which lupus was transformed into an ordinary tubercular process. Attempts have been made to explain this "latency" and "chronicity" of tubercle in lupus on certain anatomical peculiarities of the skin. Thus, Schuller[1] maintains that the infective power of the bacilli is impaired by the unfavorable nutritive conditions which the skin presents; while Neisser[2] thinks that the products of disintegration do not get into the general circulation from the cutaneous investment. Again, Koch has shown that the growth of the tubercle bacilli in cultures is notably influenced by temperature, from which the deduction is drawn that the lower temperature of the skin retards the development of the bacillus in lupus.

These arguments all fail completely when we transfer lupus to the mucous membrane of the air tract—a region most favorable for the development of a tubercular process, in that here we find it presenting the same latency and chronicity which characterized its progress in the integument. While, therefore, the microscope has revealed the identity of the morbid process and the identity of the bacillus in the two diseases, the true explanation of the cause of the marked difference in the clinical history has yet to be determined.

The pathological changes which characterize the disease in the fauces differ in no essential degree from those already described in the chapter on lupus of the nose.[3]

SYMPTOMATOLOGY.—An invasion of the upper air tract by lupus is almost invariably an exceedingly insidious process, and one which makes itself manifest at the onset by no appreciable subjective symptoms. The parts are not rendered sensitive by the disease, there is no pain in deglutition, no hypersecretion, and no cough. As the disease advances, there arises a feeling, perhaps, of stiffness in the parts and sluggishness of motion, which interferes somewhat with the promptness of function. In the later stages of the disease, when notable destruction of tissue has occurred, with abnormal adhesions, the symptoms which characterize the disease are marked by impairment of function in both deglutition and phonation. The contractility of the faucial muscles and the flexi-

[1] Ziemssen's "Handbook of Skin Diseases," Am. ed., N. Y., 1885, p. 284.
[2] Loc. cit., p. 284.
[3] Vol. i., p. 376.

bility of the parts is so far destroyed that the bolus of food cannot be promptly seized and passed into the œsophagus. Moreover, when the palate is destroyed, as is usually the case where lupus attacks the faucial region, the food is liable to pass into the nasal cavity. This same rigidity of the parts also gives rise to notable impairment of articulation, while the voice assumes a peculiar nasal tone on account of the destruction of the palate. The vocal impairment thus becomes not unlike that produced by cleft palate.

Aside from those symptoms which arise from impairment of deglutition and articulation, the invasion of the fauces by lupus, even in its late stages, gives rise to no prominent disturbances. Invasion of the larynx is almost the invariable rule soon after the pharynx has been attacked. When this occurs, other symptoms arise, such as aphonia, and perhaps dyspnœa, which are entirely dependent on the laryngeal disease. Stenosis of the pharynx to such an extent as to cause dyspnœa, or to prevent the taking of a proper amount of food, does not occur.

DIAGNOSIS.—There are certain features in the development and progress of lupus which are peculiar, and are characteristic of this disease alone. These are, the marked chronicity of the process, together with the unusual form which the ulcerative action takes on. Add to these the gross appearance of the disease on ocular inspection, and we meet with a condition which in the large majority of instances certainly should be mistaken for no other form of diseased action.

The onset of lupus is characterized by an infiltration of the mucous membrane by tubercle. This occurs in the form of small nodules, the so-called lupus nodule; so that, in place of a diffuse and uniform thickening of the tissue, we have the disease marked by irregular and rounded elevations. This may involve at first but a limited area, but, by a slow process of extension, it gradually involves, more or less completely, the soft palate, faucial pillars, and the pharyngeal wall. On gross inspection, we find the membrane presenting this peculiar nodulated or humpy outline. This is more prominent in some places than others, but the smooth contour of the mucous surface is completely obliterated wherever the diseased process has extended.

When ulceration sets in, this process occurs only in exceedingly limited areas, and is not usually recognized by any purulent discharge or yellow ulcerated surface. It occurs in small spots, lines, or fissures, and the surface presents a reddish, velvety aspect which can only be recognized as a truly ulcerative process by careful inspection.

Comparatively early after the onset of the attack, the vigorous

efforts at repair on the part of nature are evidenced by the appearance of granulating surfaces, which subsequently are converted into bands of connective tissue, forming more or less extensive cicatrices. After the disease has persisted for some time, these cicatricial bands, traversing the surface of the diseased tissue, become a prominent feature on ocular inspection.

The diseased surface is highly injected, and presents a deep red color, of a somewhat sombre and dusky hue, in marked contradistinction from that which attends an acute inflammatory process, and yet of a lighter color, as a rule, than that which we meet with in syphilitic disease. The mucous membrane surrounding the diseased process is usually perfectly normal in aspect, although occasionally slightly injected owing to the mechanical interference with the return venous circulation by the cicatricial deposit, or in consequence of the distortion of the healthy parts as the result of their contractions.

The disease need not be confounded with tuberculosis, in that the latter affection is characterized by marked anæmia of the surrounding membrane, with a pale, grayish, ulcerative process, which is distinctly and easily recognized as a progressive destruction of tissue. A tubercular ulcer, furthermore, is usually covered by a thick, ropy, tenacious mucus or muco-pus, in all these points differing strikingly from lupus, in which there is marked hyperæmia and almost total absence of secretion, while the ulcerated surface is almost identical in color with the non-ulcerated parts. Furthermore, the tubercular cachexia is almost invariably present in a marked degree in tubercular disease of the upper air passages, while in lupus the general health is not affected.

The only form of syphilis with which it may be confounded in the tertiary ulcer, in which we have a broad ulcerated surface, deeply excavated, bright yellow in color, pouring forth an abundant amount of pus and necrotic tissue, while the dark red areola surrounding it is well marked. In lupus there is no excavated surface, no yellow ulceration, no pus-secretion, and no areola.

In malignant disease we have a well-marked tumor, projecting into and encroaching upon the air tract, in contradistinction to the somewhat diffuse infiltration of the mucous membrane which characterizes lupus. The mucous membrane covering a malignant tumor is apt to be pale or mottled, whereas in lupus there is a distinct and well-distributed venous hyperæmia. The ulcer of malignant disease secretes freely of pus and necrotic tissue, and is attended by an ill-smelling, sero-sanguinolent discharge, while there is a notable absence of secretion in lupus. Moreover, the ulcerated surface in cancer is clearly recognized by its yellow sur-

face, and progressive waste of tissue, which is not observed in lupus.

If the first inspection leaves any question as to the diagnosis in a case of lupus, the doubt, I think, will in most instances be cleared up after the case has been observed for a comparatively short period, in that after the lapse of weeks, and even months, it will be difficult to recognize, oftentimes, any progress of the disease, whereas the appearances in a case of tuberculosis, syphilis, and even malignant disease change, not infrequently, from day to day. This is especially true with regard to syphilitic disease, which is the affection most frequently confounded with lupus. In case of a doubtful diagnosis as between these two diseases, we will be much aided by waiting for the extension of the ulceration, which will naturally occur if the case be syphilitic. A safer and perhaps more decisive plan would be to place the patient under antispecific remedies, and to watch their effect, which in a case of lupus would not only fail to improve the aspect of the disease, but in most instances probably would aggravate it.

COURSE AND PROGNOSIS.—As we have already seen, in the large majority of instances lupus of the air passages is secondary to cutaneous lupus. That the faucial disease is to be considered an exceedingly grave complication of the cutaneous lesion cannot be questioned, in that it involves no little discomfort, impairment of function, and even suffering; and yet the prognosis of lupus, whether of the air tract or of the integument, is not usually to be regarded as a grave one, in that it very rarely terminates fatally. Invasion of the air tract, moreover, seems to add but little to the gravity of the disease, nor does it ever take on renewed activity in these parts, maintaining rather the same great chronicity which characterizes its progress as a cutaneous affection.

Of the 79 cases of lupus of the air tract collated, the pharynx was involved in 51 instances, in most of these being secondary to the cutaneous disease. Of these 51 cases, the disease subsequently invaded the larynx in 44 instances, thus clearly indicating how serious a menace to the larynx the existence of faucial lupus presents. In one case reported by Chiari and Rhiel,[1] in a young man aged twenty-one, who had had cutaneous lupus since childhood, the disease first attacked the larynx, while the pharynx became subsequently involved. While, therefore, the presence of the disease in the fauces involves merely a certain amount of discomfort, with impairment of function, the real gravity which attaches to it is the danger of the laryngeal invasion; although in a case of faucial lupus reported by Landrieux[2] a fatal termination resulted from

[1] Loc. cit. [2] Arch. gén. de Méd., 1874, vol. ii., p. 660.

hemorrhage. The patient was a male aged forty-two, and the disease had existed for four and one-half years. The cause of the hemorrhage was an erosion of the external carotid artery by an extension of the ulcerative process. A careful reading of this case would warrant the suggestion that it was really one of syphilis; certainly, arterial erosion by lupus ulceration must be regarded as one of the rarest of events. Aside from this case, I know of no fatal termination from faucial lupus.

The clinical history of these cases, as in cutaneous lupus, is marked by more or less prolonged periods of quiescence, during which the disease either ceases to advance, or there may even be notable improvement. I know of no case of spontaneous cure of faucial lupus, although this occasionally occurs in the cutaneous disease. In a case reported by Cazin,[1] the lupus of the fauces disappeared spontaneously after convalescence from erysipelas. The patient was a female aged thirteen, who had suffered from the faucial lupus for ten months, and something over a year with the cutaneous disease. The larynx was not involved.

TREATMENT.—For convenience, we may divide the measures of treatment into topical applications, curetting, excision, internal medication, and injections of tuberculin.

Topical Applications.—The various local remedies which have been used with more or less success are: Nitrate of silver (120 to 480 grains to the ounce), tincture of iodine, lactic acid (from twenty to eighty per cent solution), solution of the perchloride of iron (120 grains to the ounce), and the galvano-cautery.

Bowen[2] reports the case of a male aged thirty-nine, in which the faucial invasion, occurring six years after the cutaneous lesion, was cured by the application of a 480-grain solution of nitrate of silver, together with the subsequent use of perchloride of iron and iodoform. Ziemssen[3] seems to have been equally successful with the solid stick of nitrate of silver, in a girl aged twelve, in whom the disease invaded the larynx primarily, there being no other lesion. The affection had lasted a number of years. In one of Hasland's[4] cases, the faucial disease seemed to yield promptly to local applications of the solid stick, in combination with the tincture of iodine. The laryngeal disease progressed, however, and subsequently demanded tracheotomy, although later the laryngeal affection was brought under control by the same measures, and, the tube being removed, the patient was discharged as cured.

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[1] Annal. des Mal. de l'Oreille, 1880, vol. vi., p. 33.

[2] Trans. of the Rhode Island Med. Soc. 1882, Providence, 1883, vol. ii., p. 487.

[3] "Cyclop. of the Practice of Medicine," Am. ed., N. Y., 1876, vol. vii., p. 853.

[4] Vierteljahrschrift für Derm. und Syph., 1883, p. 477.

The use of lactic acid is naturally suggested by its successful application in tubercular disease of the larynx. I find no definite reports, however, of its use, other than the warm commendations of Ramon de la Sota.[1]

Obertuschen[2] recommends the use of the galvano-cautery. This is a measure, however, which I am disposed to think should be resorted to with a great deal of hesitancy, in that I regard it as oftentimes capable of notable mischief.

Asch[3] reports the case of a female, aged eighteen, suffering with pharyngeal and larygneal lupus, without cutaneous lesion, which was practically cured in about twenty-two months by local applications of a 480-grain solution of nitrate of silver, together with the internal administration of five-drop doses of Fowler's solution, gradually increased to ten drops. In the latter part of the treatment a 120-grain solution of perchloride of iron was used, together with the internal administration of cod-liver oil.

Moure[4] recommends the use of chromic acid, fused on the end of a slender probe.

The Curette.—The good results so frequently obtained by curettement in cutaneous lupus naturally suggest the resort to this measure in faucial invasions. Lupus of mucous membranes, however, seems to act differently from the same disease invading the integument, and I find no records of notable success from this measure in the faucial disease. In the single case in which I have observed its use in the air tract, it seemed to have done more harm than good.

Excision.—Where the disease is limited and the parts are accessible, there can be no question as regards the advisability of the excision of the morbid tissue. Browne[5] very properly advises the amputation of the uvula where the disease invades this organ primarily. The same might be stated in regard to the free border of the palate, or perhaps one of the pillars. The success of this resort necessarily depends upon the completeness with which the diseased membrane is excised. Hence this measure is probably only available where the disease is limited and confined to the soft palate or pillars, as its success would be somewhat problematical in the pharyngeal wall. Garre[6] reports the case of a female aged twenty, in which the disease involved the base of the tongue, epiglottis, ary-epiglottic folds, and arytenoids. It had lasted some-

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[1] Op. cit., p. 17. [2] Centralbl. für klin. Med., Leipsic, 1883, vol. iv., p. 609.
[3] Trans. of the Am. Laryng. Ass'n, 1881, vol. iii., p. 16.
[4] "Leçons sur les Mal. du Larynx," Paris, 1890, p. 225.
[5] "The Throat and Nose and their Diseases," 3d ed., London, 1890, p. 438.
[6] München. med. Woch., December, 1889.

what over a year. Local applications of lactic acid and iodoform were of no avail. Excision of the epiglottis also failed to arrest the disease, and he finally performed subhyoid pharyngotomy, and excised all the morbid tissue. The procedure seems a somewhat daring one, and yet his success seems fully to have warranted it, in that at the end of five months there was no recurrence of the disease.

Internal Medication.—Local treatment, of course, should be in all cases combined with internal medication. The remedies which seem to have given the best results are cod-liver oil, arsenic, and iron. In those cases in which the disease has been arrested, it is perhaps difficult to estimate whether the favorable result has been due to the local applications or the internal medication. A careful reading of cases, however, carries the conviction that internal medication has played an exceedingly important part in controlling the diseased action. Thus, in De la Sota's [1] case the cure seems to have been due entirely to the internal administration of arseniate of sodium. Whether in this form or in the form of Fowler's solution, arsenic certainly seems to possess a somewhat specific action in the control of lupus, and our whole duty is probably done in no case without fully testing its efficacy. Its action, moreover, seems to be aided by the coincident administration of cod-liver oil and general tonics according to indications.

Tuberculin.—In regard to the injection of Koch's lymph for the control of lupus, this question will be fully discussed in the chapter on laryngeal tuberculosis, and hence need not be entered upon here. At the present writing, as far as I know, while a number of cases seem to have been temporarily improved, and the disease apparently arrested perhaps, there is no well-authenticated case of lupus, either of the skin or air tract, which has been permanently cured by this measure. The same should be stated in regard to the cantharidate of potash, as advocated by Liebreich.

[1] Op. cit.

CHAPTER XX.

FOREIGN BODIES IN THE FAUCES.

Our main consideration in this chapter is the subject of foreign bodies in the pharynx, although occasionally we find small bodies, such as pins, needles, fish-bones, etc., lodging in the faucial or lingual tonsils, and sometimes piercing the soft palate or pillars.

The pharynx being a large, open, and easily accessible cavity, the natural inference would be that the presence of a foreign body in this region might not only be easily detected, but also extracted without great difficulty; and yet it is by no means rare that cases of this sort present notable difficulties, not only in directly locating the body, but also in devising some successful method for its removal.

Among the most common objects which lodge in the fauces are small fish-bones taken in with the food. They are exceedingly liable to become imbedded in the spongy tissue of the lingual or faucial tonsils, where, on account of their color and diminutive size, it is not always easy to detect their location. They make their appearance known by the prickling pain which occurs with the act of deglutition; and the patients, moreover, find it by no means easy to distinctly locate this pain. A case recently seen by the writer admirably illustrates this. The patient, who had swallowed a fish-bone, came to me, insisting that it was in the vault of the pharynx, because he experienced a sharp, prickling sensation there with every act of swallowing. I found the bone—perhaps three-quarters of an inch long—projecting directly out from the surface of the lingual tonsil. When the tongue was drawn up in the act of deglutition, the free end of the bone pierced the mucous membrane of the naso-pharynx.

Next in frequency, we find these small bones imbedded in the faucial tonsil, the pyriform sinuses, the posterior pharyngeal wall, or the orifice of the œsophagus.

The search for them should always be made with the best light, sunlight being used if possible; when located, they are easily extracted by means of properly curved forceps, using direct or reflected light as may be necessary.

Pins, needles, and sharp objects of that sort form another class

which make their way into the fauces not infrequently. This is usually the result of the careless handling of such objects between the teeth, whence by some inadvertence they make their way into the fauces. They lodge in much the same way as the pieces of bone, giving rise to similar symptoms. The curious perversity of small children with reference to foreign bodies is well illustrated in a case reported by Adams,[1] of a child who deliberately attempted to swallow six needles and a needle-case. Five of the needles were removed from the base of the tongue, the soft palate, and oro-pharynx. The sixth extended across the opening of the larynx, being imbedded in the pharynx and base of the tongue, while the needle-case was still farther down, near the orifice of the œsophagus.

These small sharp bodies, while giving rise to distressing symptoms at the time, ordinarily involve no grave danger, although Rivington[2] reports a case of a child aged nine in whom a small fish-bone penetrated the lateral wall of the pharynx, giving rise, on the ninth day, to attacks of hemorrhage, which necessitated ligation of the common carotid artery. Death occurred ten days later, from abscess of the brain, the result of septic absorption from the suppurative process set up by the foreign body. In a case reported by Atlee,[3] of a child seventeen months old, the presence of a pin impacted between the tonsil and the pharynx gave rise to such local disturbance that death occurred on the sixth day, although the foreign body was removed twenty-four hours before the fatal issue.

These small sharp bodies usually give rise to pain on movement of the pharynx, with certain reflex disturbances, such as cough, retching, etc. If they remain a sufficiently long time, they may result in inflammation and suppuration, or, piercing the tissues, they may become encysted. Another course which is not infrequently met with consists in their migrating, even without giving rise to any notable symptoms, penetrating the tissues of the neck, and finally emerging, with or without suppuration, beneath the skin. Thus, in a case reported by Kéjes[4] a needle which had been swallowed emerged a month later behind the right ear. In a similar case observed by Kerckring[5] the needle emerged through the muscles of the neck. Lavacherie[6] reports the case of a foreign body in the fauces appearing twelve months later under the skin near the sterno-clavicular articulation. Urbantschitsch[7] reports

[1] Gaz. des Hôp., 1857, vol. xxx., p. 376. [2] Lancet, Lond., 1885, vol. ii., p. 805.
[3] Trans. College Physicians, Phila., 1884 to 1886, 3d ser., vol. viii., p. 61.
[4] Cited by Poulet: "Foreign Bodies in Surgical Practice," Am. ed., vol. i., p. 84.
[5] Ibid, p. 85. [6] Bull. de l'Acad. de Méd. Belg., 1848.
[7] Berl. klin. Woch., 1878, vol. xv., p. 720.

an instance of a wisp of straw making its way from the pharynx into the Eustachian tube, and finally emerging through the external auditory canal. Fleischmann[1] also reports having observed, post mortem, a grain of barley impacted in the pharyngeal orifice of the Eustachian tube.

If the object be sufficiently sharp, it may make its way to the skin without exciting a suppurative process, although, as the object approaches the skin, abscess-formation is likely to occur, as in the case reported by Thevenot,[2] in which a fish-bone, migrating from the fauces, gave rise to a subcutaneous abscess extending from the angle of the jaw to the chin. Dunbar[3] reports a case of a pin, two and one-quarter inches long, remaining embedded in the pharynx eleven months, giving rise to pain, cough, expectoration, etc. It was finally expelled voluntarily, in two pieces.

In a case recently seen by the author, a young girl, holding in her mouth a bonnet pin five inches in length, had fallen upon her face, driving the pin directly back through the palate, and embedding its point in one of the vertebræ. Considerable force was necessary to extract it, and yet no unpleasant symptoms followed.

Czermak[4] reports a case of a needle becoming embedded transversely in the base of the tongue.

Grave operative interference is rarely demanded in the case of these pins, needles, etc., and yet Wheeler[5] reports an instance of a man aged forty-five having swallowed a threaded needle, which was lodged in the fauces, in such a way that the left posterior palatal fold was transfixed, while its point was inserted into the left arytenoid. It was so firmly fixed in its position that lateral pharyngotomy was performed for its removal.

Living objects in the fauces would seem to be a somewhat rare accident, and yet Andry[6] mentions a case of an earthworm which made its way from the fauces through the Eustachian tube into the middle ear; while Mignon[7] has collected a large number of instances, mainly from the older writers, in which mice, eels, adders, snakes, salamanders, etc., have made their way into the pharynx and œsophagus. The most curious instances of living things are those cases in which fish have made their way into, and have been arrested in the pharynx. This accident usually occurs in tropical countries where the fishermen are wont to kill the fish

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[1] Hufeland's and Osman's Jour. der Patholog. Heilk., 1835. Lincke's Sammlung, 1836, pt. 2, p. 183.

[2] Union Méd., 1880, 3d series, vol. xxx., p. 3.

[3] Trans. of the Path. Soc. of London, 1877, vol. xxviii., p. 120.

[4] Wien. med. Presse, 1865, vol. vi., p. 81.

[5] Dublin Jour. of Med. Sciences, 1884, vol. vii., p. 385.

[6] Cited by Urbantschitsch: Loc. cit.

[7] Thèse de Paris, 1874.

by crushing its head with the teeth, and is especially liable to occur in the case of the *Anabas scandens* of the Ganges, "a small fish which possesses the curious faculty of jumping, owing to a peculiar arrangement of its fins."[1] This fish, making its way into the pharynx and œsophagus, with its head foremost, the fins insert themselves into the soft tissues in such a way that its extraction becomes a matter of great difficulty, and hence the condition of the sufferer is not only one of great suffering, but serious danger. Arlaud,[2] Duplouy,[3] White,[4] Eitner,[5] and Paul[6] report accidents of this kind in which death resulted from suffocation; while in a case reported by Anthoniesz[7] the patient's life was saved by œsophagotomy. In a case reported by Stewart[8] the fish was pushed into the stomach after six hours of effort; while MacLurin reports an instance in which the fish passed into the stomach at the end of twenty-four hours. A curious feature of this case was the development of an extensive cutaneous emphysema as the result of the wounds in the mucous membrane made by the fins. The patient, however, recovered at the end of eight days.

Smooth, rounded bodies, such as coins, medals, buttons, nuts, marbles, etc., when they make their way into the fauces, usually pass into the œsophagus, lodging at the prominence of the cricoid cartilage, or at the lower end of the œsophagus, or they may pass into the stomach. When these bodies fail to enter the œsophagus, they are usually found projecting from its orifice, or else in the pyriform sinuses. The symptoms to which bodies lodged here give rise are usually dysphagia, cough, expectoration, and some loss of voice, according as the larynx may be involved, together with certain reflex disturbances, such as convulsive movements of the fauces, while in young children general convulsions may ensue. The interference with deglutition necessarily results in impaired nutrition, with loss of flesh.

If retained sufficiently long, metallic objects such as copper coins, may give rise to metallic poisoning, as in a case reported by Faucon.[10] The location of a foreign body of this kind is based not only on inspection by direct and reflected light, but also on exploration of the parts by means of the index finger. If the patient is young, external manipulation may be of service, as in a case

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[1] Poulet: Op. cit., p. 67.
[2] Gaz. des Hôpit., 1863, p. 147.
[3] Gaz. des Hôpit., 1863, vol. iii., p. 238.
[4] New York Med. Press, 1860, n. s., vol. iii., p. 41.
[5] Woch. für die gesammt. Heilk., Berlin, 1850, p. 30.
[6] Med. Times and Gaz., London, 1874, vol. i., p. 486.
[7] Lancet, London, 1854.
[8] Cited by Poulet: Op. cit., p. 67.
[9] Lancet, London, 1873.
[10] Bull. de la Soc. de Chir., 1877, n. s., vol. iii., p. 158.

reported by Walker[1] in which a coin was not only recognized in this way, but, after the administration of chloroform, was dislodged and expelled by the same manipulation. Ordinarily, however, the removal of these objects is accomplished with comparative ease by means of a properly curved forceps, which is manipulated with the aid of the laryngeal mirror, or, better still, I think, as a rule, by means of the index finger of the left hand. The administration of an anæsthetic is rarely necessary, except in very young children, for, whereas in the œsophagus the use of ether or chloroform is necessary in order to produce relaxation of muscular spasm, a foreign body in the pharynx, or mouth of the œsophagus is not ordinarily held with sufficient force to interfere with its extraction. It is a common practice in these cases, especially in children, to administer an emetic for the expulsion of these objects. This is always an experimental measure, and in many instances, answers an excellent purpose. Where, however, the body can be reached and located by means of the index-finger, it is comparatively rare that it cannot also, with equal facility, be seized and removed by means of the forceps. Of course, in exploring the fauces by means of the finger, retching and even vomiting is liable to be excited, and the object expelled thereby, as in the case reported by Thouvenin.[2] This is probably a better method of producing emesis than the administration of drugs.

Impaction of these bodies in the fauces is comparatively rare, and yet when it does occur it is liable to give rise to inflammation and subsequent pus formation. Thus, in a case reported by Gauttani[3] a man died on the nineteenth day from a large abscess which formed beneath the pharynx and the thyroid body, as the result of a chestnut lodging in the pharynx. In a case reported by Singletary,[4] of a child two years and a quarter old, a nickel in the pharynx gave rise to two or three attacks of pneumonia yearly for eight years, and finally a large amount of blood and pus was vomited, and the coin passed per anum, eight years and two months after it was swallowed. In a case reported by Ward[5] a copper halfpenny became impacted in the fauces of a child a year and eight months old, giving rise to cough, emaciation, hoarseness, etc., and was coughed up six months later.

We have thus endeavored to group, to a certain extent, the commoner objects which we are called upon to remove from the

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[1] Cited by Poulet: Op. cit., p. 108.

[2] Bull. de la Soc. de Chir. de Paris, 1875, n. s., vol. i., p. 707.

[3] Mémoires de l'Acad. de Chir., vol. iii., p. 344.

[4] Louisville Med. News, vol. x., p. 254.

[5] Trans. of the Path. Soc. of London, 1848–50, vol. ii., p. 50.

fauces. Any attempt at further classification would be useless, in that the number and variety of objects which are met with here are endless. Sands[1] reports a case of a fishhook, with the snell or line attached, which became lodged in the fauces, while the cord protruded in the mouth. In this case he passed his finger down along the line, until the bend of the hook was engaged, when it was forced downward sufficiently to disengage the barb, and then easily extracted.

That all danger is not over after the expulsion of the foreign body is very well illustrated by a case reported by Sée[2] of a small boy who swallowed a metallic pen, which became lodged in the pharynx. As the surgeon was about to remove it, it became dislodged and passed into the stomach, whence it was expelled by an emetic. On the following day slight subcutaneous emphysema developed, and subsequently symptoms set in which led to the diagnosis of an abscess of the mediastinum, communicating with the œsophagus. Recovery, however, took place at the end of a month.

The dropping of false teeth into the pharynx during sleep is by no means an uncommon accident, many such cases having been reported by Pollock,[3] Paget,[4] Cock,[5] Carlyle,[6] Butlin,[7] Skey,[8] Soltsien,[9] Warren,[10] Foucaud de l Espaguery,[11] and others. In a number of these cases the accident occurred during sleeping hours. In Warren's it happened during the administration of an anæsthetic; in Pollock's as the result of a fall. The symptoms are usually pain in the throat and dysphagia, with more or less dyspnœa, according to the size and location of the plate. In Paget's case the plate was lodged in the glosso-epiglottic fossa, and was the unrecognized cause of pain on swallowing, and progressive emaciation for nearly four months. In Carlyle's case the teeth remained in the pharynx for ten hours, giving rise to no symptoms other than slight impairment of phonation. Pollock's patient died from suffocation immediately upon the occurrence of the accident. I find no other fatal case reported, although Butlin's case died after an external pharyn-

[1] New York Med. Jour., 1866, vol. iii., p. 214.

[2] Bull. de la Soc. de Chir. de Paris, 1875, vol. i., p. 271

[3] Lancet, London, 1869, vol. i., pp. 456 and 490.

[4] Med. Times and Gaz., London, 1862, vol. i., p. 58.

[5] Med. Times and Gaz., London, 1856, vol. i., pp. 135 and 188; also Guy's Hos. Reports, London, 1868, 3d series, vol. xii., p. i.

[6] Lancet, London, 1880, vol. i., p. 99.

[7] Med. Press and Circular, London, 1884, vol. xxvii., p. 278.

[8] Lancet, London, 1861, vol. ii., p. 328.

[9] Berl. klin. Woch., 1878, vol. xv., p. 255.

[10] Boston Med. and Surg. Jour., 1860, vol. lxii., p. 400.

[11] Gaz. des Hôp., Paris, 1859, vol. xxxii., p. 122.

gotomy—an operation which was done also in both of Cock's cases, although in most instances the plate is removed with comparative ease by means of forceps.

Instances of the swallowing of large and irregular pieces of bone taken in the food are exceedingly common, cases having been reported by Arnott, Millard,[2] Verneuil,[3] Packard, Grellois, Eve,[6] and others. These bodies usually lodge in the orifice of the œsophagus, and more rarely in the pyriform sinuses. They are usually irregular in shape, with sharply projecting points; hence they become firmly impacted. Their presence not infrequently constitutes a condition of no little gravity, on account of the difficulty of their removal, and the dyspnœic symptoms which are very liable to occur. Thus, in Millard's and Verneuil's cases death ensued immediately upon the accident, from asphyxia. In Grellois' case local ulceration with progressive emaciation set in, and, although the bone was expelled two months later, the patient succumbed soon after. In Arnott's case, pharyngotomy was done, the patient, a child two and a half years old, dying soon after of pneumonia.

Among the other foreign bodies found in this region may be noted: A pocket-knife, reported by Smith;[7] thimbles, by Monti,[8] and Parrish;[9] a comb, by Morton;[10] an irregular piece of tin, by Clarke;[11] a jackstone, by Wallace;[12] and a plum-stone, by Justi.[13] These cases possess no points of special interest which have not already been touched upon, unless perhaps we except Smith's case, which was that of a woman aged sixty-two, in which a pocket-knife remained embedded in the tissues of the fauces for nine months, giving rise to attacks of hemorrhage, to one of which she finally succumbed. The presence of the foreign body was only definitely ascertained after death. In Clarke's case also, a child aged one year, a foreign body in the orifice of the œsophagus gave rise to dyspnœa demanding tracheotomy. Death occurred in about ten days after the commencement of the symptoms. A post mortem revealed the presence of a foreign body which had hitherto been

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[1] Med.-Chir. Trans., 1833, vol. xviii., p. 86.

[2] Bull. de la Soc. anat. de Paris, 1859, vol. xxxiv., p. 185. [3] Ibid.

[4] Trans. of the Coll. of Phys. of Philadelphia, 1863, n. s., vol. iii., p. 253.

[5] Bull. de la Soc. anat. de Paris, 1835, vol. ix., p. 121.

[6] Southern Med. and Surg. Jour., Augusta, 1849, n. s., vol. v., p. 73.

[7] St. Barth. Hosp. Reports, 1883, vol. xix., p. 459.

[8] Jahrbuch für Kinderheilk., Vienna, 1865, vol. vii., pt. 3, p. 62.

[9] Am. Jour. of Med. Sciences, Philad., 1835, vol. xvii., p. 540.

[10] Surgery of the Penn. Hos., Philad., 1880, p. 332.

[11] Indian Med. Gaz., Calcutta, 1885, vol. xx., p. 723.

[12] Proceedings of the Med. Soc. of the County of Kings, Brooklyn, 1883 and 1884, vol. viii., p. 164.

[13] Deutsche Zeit. für Chir., 1882, vol. xvii., p. 158.

unsuspected. There was ulceration and perforation in the posterior laryngeal wall. Justi's case required an external pharyngotomy. In Parrish's and Morton's cases the foreign body was in the vault of the pharynx. In Wallace's case tracheotomy was necessary on the second day, and death occurred eighty-eight hours after the accident, the pharyngeal wall having been perforated by ulcerative action, and the cervical vertebræ eroded.

CHAPTER XXI.

NEUROSES OF THE FAUCES.

THE great activity and diversity of function which characterize the parts in the faucial region, as manifested in the processes of respiration, deglutition, and articulation, naturally demands a somewhat unusually rich nerve supply. Hence, we might naturally expect to find this region the seat of numerous disturbances of a neurotic character. As a matter of clinical observation, however, I am disposed to think that genuine neuroses as involving the organs of the fauces are comparatively rare. For the present consideration, they may be classified as follows:

1st. Abnormalities of sensation.
2d. Neuralgias.
3d. Reflex neuroses.
4th. Spasmodic disturbances or chorea.
5th. Myopathic paralysis.
6th. Bulbar paralysis, or paralyses due to central lesion

ABNORMALITIES OF SENSATION.

Elsberg[1] has given us an exceedingly elaborate description of hyperæsthesia and anæsthesia of the pharynx, describing them as distinct diseased conditions. A careful reading of his cases warrants the statement that this is somewhat of a refinement, in that in those cases in which the sensibility of the region seems exaggerated or diminished the condition is to be considered as the local manifestation of a general condition, and one usually met with in nervous and hysterical females. Cohen,[2] however, thinks that both hyperæsthesia and anæsthesia may occur as independent affections involving the palate as well as the pharynx.[3] Paræsthesia is described by A. H. Smith,[4] Fr. Knight,[5] and others as a perverted sensation of tingling, prickling, or as of a foreign body in the fau-

[1] Am. Jour. of Med. Sciences, 1881, vol. lxxxii., p. 330.
[2] "Diseases of the Throat and Nasal Passages," Philada., 1879, p. 215.
[3] Loc. cit., p. 278.
[4] Trans. of the Am. Laryngol. Ass'n, 1881, vol. ii., p. 293.
[5] Trans. of the Am. Laryngol. Ass'n, 1887, p. 142.

ces. These cases, in the very large majority of instances, if not all, are cleared up by the more careful diagnoses now made, which reveal the symptoms as due to the presence of enlarged glands in the glosso-epiglottic fossæ, to distended tonsillar crypts, or some other local organic change.

In my own experience, I have seen no case in which the local conditions were such as to demand topical remedies, nor do I believe such to be in any degree efficacious. The condition is one which must be corrected by the administration of general tonics and other remedies directed to the constitutional habit.

Neuralgia.

A sore throat, with no accompanying morbid inflammatory lesion, which sufficiently accounts for it, is a matter of frequent observation. Moreover, it is exceedingly difficult, oftentimes, to definitely locate the source of a painful symptom referable to the fauces. Many of these cases, therefore, we are compelled, by exclusion, to classify as neuralgic in character. They usually occur in nervous and hysterical women, and are to be considered as local manifestations of a general condition. In other cases we not infrequently meet with neuralgic pains in connection with chronic follicular pharyngitis, as has been already observed in the discussion of that affection. This is particularly true in connection with pharyngitis lateralis. Chapman[1] reports a series of four cases of what he describes as myalgia of the pharynx and larynx, in which the prominent symptoms were pain and tenderness on pressure, and which were cured by the administration of quinine and iron. I find it difficult to account for muscular pains of this character, and am disposed to think that there was a neuralgic element in these cases. Türck[2] reports a series of six cases of neuralgia in the fauces, in most of which the pains were mainly confined to one side. The duration of the attack was from six weeks to six years, and the more obstinate only yielded to resection of the nerve involved.

The source of the pain is probably either in the terminal filaments, or small branches of the glosso-pharyngeal, and here also the indications for treatment are the administration of iron, quinine, and general tonics for the correction of the systemic condition. Notwithstanding we find many references in literature to the valuable effect of bromide of potash, chloral, morphia, hyoscyamus, etc., locally applied, I am disposed to think that topical remedies

[1] Trans. of the Am. Laryngol. Ass'n, 1887, p. 136.
[2] Wien. allgem. med. Zeit., 1862, vol. vii., No. 9.

are of no avail. It is of the utmost importance, however, to thoroughly investigate the condition of both the lower and upper pharynx, together with the tonsils and the glands at the base of the tongue, for I am confident that many cases of faucial pain may be traced to a morbid condition of some of the lymphatic bodies in this region, such as the faucial and lingual tonsil, etc., or the existence of imprisoned secretions, or some other local cause. I do not think, however, that local lesions give rise to neuralgia, except in those cases in which the general system also is at fault. Hence, the internal administration of quinine, iron, general tonics, etc., is probably indicated in every case.

Reflex Neuroses.

We not infrequently see reported instances of various reflex disurbances due to the presence of enlarged tonsils, such as cough, aural pain, nightmare, gastric disorders, etc. I do not think these should be regarded as purely reflex disturbances, in that they are oftentimes directly symptomatic of the tonsillar disease. In the same category I think we may place the pharyngeal irritation described by Harrison Allen.[1]

That we may have reflex disturbances from hypertrophied tonsils seems clearly shown in the two cases reported by Ziem,[2] one of conjunctivitis and one of keratitis, which were cured only after treatment directed to the morbid condition of the tonsils, although it should be stated the ocular trouble was at the same time subjected to active treatment. While, therefore, the cases are not purely reflex, the condition of the tonsils seems to have seriously interfered with the success of the eye treatment, until they were also brought under treatment. Heryng[3] reports four cases of reflex cough due to follicular disease of the pharynx, the cough in each case being excited, probably, by the diseased follicles. The reflex connection, I do not think, is absolutely sure, as I see no reason why cough may not be directly symptomatic of pharyngeal disease. In the two cases of neuralgia reported by Hack,[4] which were cured by cauterizing the enlarged follicles in the pharynx, the reflex connection seems more clearly established.

Spasmodic Disturbances, or Chorea.

Abnormal muscular contractions, as involving the faucial region, are largely confined to the soft palate, and as a rule assume

[1] Medical News, Philada., 1882, vol. xli., p. 31.
[2] Allg. med. Cent. Zeit., 1886, vol. lv., p. 317.
[3] Rev mens. de Laryngol., 1886, vol. vi., p. 177.
[4] Deut. med. Woch., 1883, vol. ix., p. 61.

that peculiar character, which from a clinical point of view is generally described under the designation of chorea, although the cases which we find reported in literature are generally defined as instances of clonic spasm of the palate, the term chorea not being used.

In the large majority of cases, the muscle which seems to be mainly involved is the levator palati, under the influence of which the velum, at varying intervals, becomes subjected to a curious vibratory movement, repeated a number of times, and finally ceasing; in other words, the soft palate is rapidly drawn up against the pharyngeal wall, and again released, and this movement is repeated a number of times until the clonic spasm of the levator muscle ceases. Each contraction is accompanied by a curious clicking sound in the ear, which is noticed not only by the patient, but by one standing near, which probably arises as the soft palate detaches itself from the pharynx after each contraction. The movements during their progress are of a somewhat rhythmic character, which is appreciated not only by the patient, but can be easily observed by ocular inspection of the fauces.

Instances of clonic spasm of the levator muscle have been reported by Boeck,[1] Holmes,[2] Kupper,[3] Williams,[4] Brandeis,[5] Schech,[6] Seifert,[7] Burnett,[8] and others.

In Seifert's case the palatal spasm was accompanied by similar movements in the facial muscles, while occasionally a spasmodic movement of the tongue was substituted for the movements of the palate. In most instances, however, the palatal movements occurred independently.

Tonic spasm of the palatal muscles proper never occurs as far as I know, although Wagner[9] states that in advanced stages of paralysis agitans movements of the soft palate may occur very similar to those of the muscles of the trunk or extremities. Spencer[10] reports two cases of clonic spasm of the constrictor muscles of the pharynx, in which there were also similar movements of the eyeball, as well as of the arytenoid cartilages. These movements, moreover, were synchronous in all of the parts involved. The origin of the disease here was in a cerebral tumor.

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[1] Arch. f. Ohrenheilk., 1869, vol. ii., p. 206.
[2] Arch. of Otology, vol. viii., p. 144.
[3] Arch. f. Ohrenheilk., 1873, vol. vii., p. 296.
[4] Arch. of Otology, 1883, vol. xii., p. 83. [5] Ibid., p. 14.
Münch. med. Woch., 1886, vol. xxxiii., p. 385.
[7] Internat. klin. Rundschau, 1887, vol. i., p. 914.
[8] "A Treatise on the Ear," Phila., 1884, p. 424.
[9] Ziemssen's "Encyclop.," Amer. ed., vol. vi., p. 993.
[10] Lancet, Lond., 1886, vol. ii., p. 702.

In the cases in which the levator palati muscle alone was involved, the origin of the disease seemed to be quite as obscure as is the case in instances of general chorea.

Seifert seemed to think, in his case, that the affection took the nature of a nasal reflex, in that the treatment of an accompanying hypertrophic rhinitis, appeared to give relief. This, however, was not permanent.

In Schech's case, a more rational cause of the affection was assigned in an accompanying facial neuralgia, which was the result of a broken nose, in that the occurrence of muscular contraction is a not infrequent accompaniment of neuralgic disturbances.

In most cases, however, it is impossible to assign a definite cause to the occurrence of the disorder.

Curiously enough, in Williams' case the palatal movements disappeared during an attack of acute tonsillitis, reappearing, however, when the inflammation subsided.

The recognition of the trouble is made comparatively easy by the prominence of the subjective symptoms, namely, the peculiar clicking in the ear, together with the ease with which the rhythmic movements of the palate can be observed by direct ocular inspection. The same can be said where the movements occur in the pharynx.

The prominent indication for treatment consists in the removal of any possible source of reflex disturbance, such as intranasal or pharyngeal disorders. We possess no drug which exercises a specific influence on choreic affections. Probably our most efficient remedy lies in the administration of some preparation of arsenic, in connection with general tonics and iron. In addition to this, of course a certain amount of attention should be directed to the regulation of the diet, clothing, outdoor exercise, bathing, etc.

Clonic spasm of the faucial muscles occurs occasionally in connection with acute inflammatory affections, such as quinsy, acute uvulitis, and more rarely in acute pharyngitis. It also occurs in its most distressing form in the second stage of hydrophobia. This form of spasm, however, is of minor importance and merely symptomatic of the graver disease.

Myopathic Paralysis.

This term is one which has come into somewhat general use as describing a form of paralysis which is confined to individual muscles or groups of muscles. The name would seem to suggest that the true lesion lies in some morbid condition of the muscular

fibres, rather than in any defective innervation. This view is probably an error, in that the true pathological condition is probably some abnormality in the smaller nerve trunks or terminal fibres; and yet the term "myopathic paralysis" being one of such general use, I do not feel at liberty to discard it.

As affecting the faucial region, we may have a paralysis involving a portion or all of the muscles which act upon the soft palate. The paralysis may be unilateral or bilateral; or we may have it complete on one side and incomplete on the other, viz., a paralysis of one half of the palate with paresis of the other half.

We occasionally meet with cases in which not only the palate, but the constrictor muscles of the pharynx are involved also. The distinctive feature of this form of paralysis occurring in this region, however, is that the muscles which are involved group themselves together more with reference to their special function than with reference to their nerve distribution; which still further emphasizes the localized character of the paralysis, in contradistinction from that due to a diseased condition of one of the larger nerve trunks.

A classification based on the groups of muscles involved, therefore, possesses no practical interest to us. The principal point for discussion in this connection, however, lies in the causation. In the very large majority of cases, the paralysis is due to an attack of diphtheria. As has already been shown, we not infrequently met with it as a sequela to an attack of croupous inflammation in some portion of the fauces; or again, though still more rarely, it is observed to follow a simple catarrhal inflammation of the mucous membrane of the fauces, as in the cases reported by Knight,[1] Coutts,[2] and Broadbent.[3]

This latter observer also instances a case in which it came on spontaneously, apparently, in an anæmic and debilitated child.

It is often assumed that the occurrence of paralysis in the palate of a child is sufficient evidence of the diphtheritic character of a previously existing faucial inflammation. I think this view must be abandoned, and that we must not only accept the teaching that a myopathic paralysis may follow any form of inflammatory lesion in the fauces, but also that it may occur without any previously existing local affection. If we accept this view, it necessarily follows, I think, that the cause of these local paralyses is not in a localized lesion, but in a general blood condition. The truth of this statement is further emphasized by the fact that the extent of local paralysis bears no distinct relation to the extent of the

[1] N. Y. Med. Jour., June 15th, 1886. [2] British Med. Jour., 1888, vol. ii., p. 75.
[3] Trans. Clin. Soc., Lond., 1871, vol. iv., p. 92.

local inflammatory process which preceded it, whether of a diphtheretic or of a simple catarrhal nature. If, then, we accept the general blood condition as the cause of the localized paralysis, the method of its development becomes a question of interest. Any observation on this point is of course purely speculative; in view of the fact, however, that the local inflammatory process bears no relation whatever to the extent of local paralysis, we necessarily exclude any question of some obscure morbid process invading the muscular structure itself. By the same process of reasoning, I think we may to an extent exclude the idea that the paralysis is due to the involvement of the terminal filaments of the nerves.

We are therefore led to the conclusion that the pathological lesion which causes the paralysis lies probably in the smaller nerve trunks; although most excellent grounds exist for the belief entertained by many observers that the blood condition acts primarily upon the nerve centres.

That the very large majority of cases of myopathic paralysis should follow diphtheria is easily understood when we consider the activity of the blood poison, which is characteristic of this disease; and so, in lesser frequency, we find it following the less active blood poisons of croupous inflammation, and so downward.

If we seek further for an explanation, as to why certain muscles become the seat of myopathic paralysis, I think the suggestion of an answer at least would lie in the fact that those muscles which are the seat of the greatest functional activity would naturally be more liable to become paralyzed than less busy muscles. The heart is the busiest muscle in the body, and its liability to paralysis in diphtheria is shown by numberless clinical observations. The next busiest muscles in the body are those of respiration, phonation, and deglutition, especially those seated in the fauces. Here, therefore, we find a notably favorable site for the development of myopathic paralysis.

In those cases where the palate is paralyzed, the symptoms have reference mainly to the loss of function of this organ. Deglutition is somewhat impaired, and the food has a tendency to make its way into the nasal cavity. This is especially true of fluids. The prominent symptom, however, has reference to the voice, which is thick, decidedly nasal in character, and articulation is exceedingly difficult, phonatory waves escaping into the nasal cavity. Whistling and puffing out the cheeks are also impossible. Expectoration also is notably hampered; consequently there is a tendency to accumulation of mucus in the fauces, which the patient is unable to expel. These symptoms are quite marked when both sides of the palate are paralyzed. Occasionally, however, the par-

alysis is confined to one side, in which case, of course, the symptoms are somewhat modified.

An inspection of the parts easily reveals the condition. Attention is first called to it, however, by the prominent subjective symptoms. The palate and uvula hang down motionless, and fail to respond to ordinary stimuli, such as the probe, etc. If one side only is involved, the uvula is notably drawn to the healthy side, while the pillar of the fauces and whole palate seem to be drawn down by the action of the palato-glossus and palato-pharyngeus muscles (see Fig. 32).

We occasionally see cases, usually in adult life, in which there is a markedly paretic condition of the muscles of the fauces, mainly

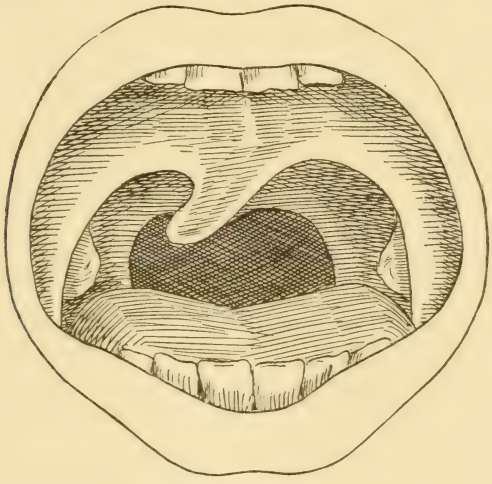

FIG. 32.—Paralysis of Left Side of Palate.

noticeable in the impairment of the act of deglutition. The bolus of food, reaching the pharyngeal cavity, is not seized with sufficient vigor to propel it into the œsophagus, nor can it be expelled into the mouth with ease. The result is an attack of choking, which is oftentimes a source of great distress to the patient, although rarely dangerous. In a series of cases of this sort reported by the writer,[1] the symptoms simulated, in no small degree, that of stricture of the œsophagus. The diagnosis was based on the fact that the constrictor muscles of the pharynx responded very sluggishly to the impact of the probe, and, furthermore, sensibility was diminished, as decided by the æsthesiometer. The disease occurred in individuals of impaired general health, and disappeared under the administration of general tonics, such as chalybeates and strychnia, and the application of the faradic current.

[1] Archives of Laryngol., vol. iv., p. 192.

Practically, the same indications are present in the cases of complete paralysis following diphtheria and other diseases.

The faradic current here, I think, aids materially in hastening the cure of the disease, and should be administered by applying the sponge electrode to the back of the neck, while a small-pointed metallic electrode is pressed upon the faucial muscles consecutively.

The prognosis is always good in cases of so-called myopathic paralysis, although in some instances the complete restoration of motility is delayed for weeks and even months, especially after severe cases of diphtheria.

Paralysis Due to Bulbar Lesion.

Under this heading we consider those forms of paralysis which are the result of a diseased condition of the medulla oblongata. This organ, as we know, is not only an organ of nerve conduction, but it also contains within it certain nuclei, which act as nerve centres, presiding over certain vital phenomena, such as respiration, cardiac inhibition, vaso-motor control, deglutition, etc. We find located here the centres of phonation and articulation, which may also act as independent centres, although their action is more dependent upon the integrity of the cerebral cortex than those above mentioned.

In the present consideration of faucial paralyses, we have to do mainly with the functions of articulaton and deglutition. Swallowing is a somewhat complex act, which is performed by muscles supplied by the hypoglossal, glosso-pharyngeal, facial, spinal accessory, trigeminus, and the vagus nerves, all of which have their origin in the medulla, although the exact situation of the nerve centre which presides over the act of deglutition has not been located.

The phonatory waves are converted into articulate speech by the nicely adjusted and delicately combined movements of muscles supplied by the glosso-pharyngeal, hypoglossal, facial, spinal accessory, and trigeminus nerves. The glosso-pharyngeal and vagus nerves probably derive many of their motor fibres from the accessory, although another possible source may be in other of the motor nerves above mentioned, by ganglionic connection. The four motor nerves have their origin in close contiguity to each other in the floor of the fourth ventricle; hence it is easy to understand how a morbid process affecting but a small portion of the medulla may give rise to a paralysis involving several distinct functions; for, as we know, both the phonatory and respiratory muscles of the larynx receive their innervation from the recurrent

laryngeal nerve, which probably derives its motor fibres also from the accessory.

Excluding those cases which we have already designated as myopathic paralyses, all cases of paralysis of muscles of the fauces must probably be traced to some central lesion in the medulla, with the exception of instances of paralysis of the levator palati, and azygos uvulæ muscles, which derive their innervation from the facial. These latter muscles, therefore, may be the seat of a paralysis as the result of pressure on the nerve trunk. This is especially liable to occur where the facial nerve passes through the aqueductus Fallopii.

A paralysis, moreover, involving the functions of deglutition or articulation, must be accepted as indicating a lesion of the medulla or its coverings, to the exclusion of the cerebral cortex, in that these functions are reflex, or purely automatic, and are presided over by nerve centres located in the bulb.

The lesions which may give rise to paralysis in the fauces are acute and chronic bulbar myelitis, hemorrhage, embolism, tumors, and basilar meningitis.

Up to comparatively recent times, all forms of paralysis due to disease of the medulla were described under the head of "progressive bulbar paralysis," indicating an essentially chronic affection. Later investigations have shown the existence of a similar disease running an acute course, while still later study has shown that embolism, apoplexy, and tumors in the medulla may be the source of the peculiar train of symptoms which characterizes bulbar disease.

Acute Bulbar Paralysis or Acute Bulbar Myelitis.—This form of paralysis running an acute course is an exceedingly rare event. Our attention was first called to it by Leyden,[1] who reported in detail the clinical histories and results of autopsies in three cases. These cases occurred respectively at the ages of thirty-six, fifty-two, and sixty-two, and terminated fatally at the end of from four to ten days. There were two females and one male. Etter[2] reports a case, occurring in a boy aged fifteen, in which the paralytic symptoms were rapidly progressive, death resulting from pneumonia on the tenth day. According to Gowers,[3] Etter's case only was of a true inflammatory character, while he regards Leyden's as of an epileptiform nature, although Erb[4] classifies them as instances of acute bulbar myelitis. Of the same nature, probably, was the case

[1] Archiv für Psychiat. und Nervenkrank., 1876, vol. vii., p. 44.
[2] Correspondenzblatt für Schweizer Aerzte, 1882, No. 24.
[3] "Diseases of the Nervous System," Am. ed., Phila., 1888, p. 941.
[4] Ziemssen's "Cyclop.," Am. ed., vol. xiii., p. 902.

reported by Ollivier,[1] of a student twenty-one years of age, suddenly attacked with dysphagia, sickness, vomiting, etc., which grew rapidly worse in connection with violent pains in the cervical region. Dyspnœa, together with paresis, and finally paralysis of both upper extremties occurred, and death resulted on the eighth day. The autopsy is reported as showing "inflammatory action, involving both the meninges and two inches of the upper portion of the spinal cord." The symptoms n the case indicate quite clearly an implication of the bulbar nuclei.

The characteristic symptoms of the acute form of the disease are the suddenness of the invasion, and the rapidity with which the paralysis develops. The patient is seized with headache, giddiness, and perhaps vomiting, together with general weakness and unsteadiness of gait. There is no loss of conciousness. The dysphagia increases, and articulation becomes thick and difficult. The movements of the tongue and lips show evidence of the progressive involvement of the bulbar nuclei, which preside over the functions of articulation, respiration, and cardiac inhibition. Articulate speech becomes still more difficult, respiration becomes irregular and halting and occasionally interrupted, giving rise to the Cheyne-Stokes respiration. The pulse also becomes small, rapid, and intermittent, and a fatal termination soon follows.

The indications for treatment here are, naturally, those of an ordinary spinal myelitis, and consist of energetic antiphlogistic measures, such as local blood-letting, Chapman's ice bags to the nape of the neck, inunction of mercurial ointment, the moderate use of derivatives, such as saline laxatives and diuretics, and the employment internally of ergot and belladonna.

Chronic Bulbar Paralysis or Chronic Bulbar Myelitis. —This affection was first described by Duchenne[2] as a separate disease, under the name of "progressive muscular paralysis of the tongue, soft palate, and lips," although isolated instances of this affection had previously been reported by Bell,[3] Trousseau,[4] and Dumenil.[5] While Duchenne gives an admirable clinical description of the disease, its true pathological character remained obscure until Wachsmuth[6] stated that the cause of the disease would be found in a morbid lesion of the medulla, and hence suggested that the disease be

[1] "Traité des Maladies de la Moëlle épinière," 3d ed., vol. ii., p. 319.

[2] Arch. gén., 1860, vol. ii., pp. 283 and 431.

[3] "On the Nervous System of the Human Body," London, 1830.

[4] "Lectures on Clinical Medicine," New Sydenham Society Publications, London, 1868, vol. i., p. 117.

[5] Gaz. Hebdom., 1859, p. 390.

[6] "Ueber progressive Bulbärparalyse und Diplegia facialis," Dorpat, 1864. Also New Sydenham Soc. Pub., 1877.

called "progressive bulbar paralysis." Later investigation not only confirmed Wachsmuth's theoretical suggestion, but also revealed the fact that the starting-point of the disease lay in certain degenerative changes in the bulbar nuclei, which led Kussmaul[1] to propose the name of "progressive bulbo-nuclear paralysis."

The disease consists essentially in an atrophy of the ganglia of the bulb which preside over the movements of the soft palate, pharynx, larynx, tongue, and lips, and results therefore in the progressive paralysis of deglutition, articulation, and phonation. As the sclerosis of the bulb progresses, we have the still further disturbances of respiration and cardiac inhibition manifesting themselves.

We can assign no cause for the disease. That most frequently suggested is exposure to cold. It occurs more frequently in men than in women, and is essentially a disease of later life, occurring usually after the fourth decade.

The pathological changes which occur consist essentially of an atrophic degeneration of the ganglion cells in the gray nuclei of the bulb, together with a certain amount of atrophy of the nerve tracts, in connection with an excessive deposit of connective-tissue cells; in other words, the development of a true sclerosis. In the majority of instances, the nucleus of the hypoglossus is the first involved, and this is followed successively, by the nuclei of the spinal accessory, the vagus, and still later of the facial. These changes, moreover, are usually bilateral.

The onset of the disease is ordinarily quite insidious, the first symptoms being a slight sensation of uneasiness in the back of the neck, with perhaps a little hesitancy of speech or articulation. This is soon followed by a slight difficulty in deglutition. In connection with this there is a certain amount of loss of reflex irritability of the mucous membrane of the pharynx. The impairment of deglutition is due primarily to paralysis of the palate, which also notably affects the vocal tones, giving rise to a nasal twang, with imperfect articulation. Mastication is soon affected, mainly owing to the defective movements of the tongue in managing the bolus of food. The voice is liable to be affected somewhat early in the course of the disease, becoming weak, hoarse, and perhaps aphonic.

As a rule, however, the laryngeal symptoms are not very prominent. This seems a rather curious feature of the disease, and one not easily accounted for. In my own experience, in unilateral bulbar disease due to embolism, endarteritis, etc., where the larynx has been involved, it is usually a paralysis of abduction that is

[1] Sammlung klin. Vorträge (Innere Medicin), No. 20, p. 439.

noticed. If the same rule followed in Duchenne's disease, a bilateral paralysis of abduction would give rise to notable and distressing symptoms of dyspnœa, with recurrent attacks of spasm of the glottis. Again, where tabes has invaded the medulla, clinical experience teaches us that it is very liable to give rise to what has been termed laryngeal crises, which are due most frequently to bilateral paralysis of the abductors. Why this should not be more liable to occur in progressive bulbar paralysis, at first seems somewhat puzzling. Gowers[1] states that, whereas paresis of the laryngeal muscles is quite common, "laryngeal palsy rarely becomes complete, and it is still rarer for the power of abduction to be specially lost." As we have already seen, the nucleus of the accessory nerve is invaded somewhat late in the disease. Hence, the fact that complete abductor paralysis does not occur can only be explained by the fact that death ensues before the sclerosis has fully destroyed the nuclei of the accessory nerve. Why these nuclei are so frequently destroyed in tabes and not in Duchenne's disease cannot be fully explained.

As the lips become involved, and their motility lost, the articulation of the labials becomes exceedingly difficult, while at the same time the patient loses his ability to blow, whistle, or move his mouth, which now, becoming motionless, and the lower lip somewhat pendulous, gives a curious, woe-begone expression to the face. With the loss of control of the lips, the saliva tends to dribble from the angles of the mouth, the patient ordinarily inclining forward, to prevent it trickling into the throat, where, on account of the difficulty in deglutition, it would naturally make its way into the larynx.

At the onset of the disease, the muscular condition is one of simple paresis. As the disease progresses, it becomes more and more a complete paralysis, interfering with deglutition, articulation, and phonation. As the respiratory centres are involved, the condition of the patient becomes a most pathetic and distressing one, in that respiration is accomplished with difficulty. Dyspnœa becomes a common symptom. The deglutition becoming impaired, the nutrition of the body is interfered with, to such an extent that notable emaciation ensues; and when we consider the utter helplessness of the attendants or physician to afford relief, the final termination in death is to be looked upon as a happy release.

The prognosis in these cases is an exceedingly grave one, and death usually occurs in from one to five years after the manifestation of the first symptoms, no case of recovery having been recorded. Furthermore, the course of the disease is a steadily pro-

[1] Op. cit., p. 936.

gressive one, any temporary arrest or amelioration of symptoms being an exceedingly rare event, the cause of death being either general inanition, or from the dyspnœa or heart failure.

The disease is not infrequently associated with progressive muscular atrophy. So close is this association that to many it has indicated a close relationship, if not essential identity, between the two affections. The disease is not infrequently associated with amyotrophic lateral sclerosis, and it also may develop in the later stages of tabes, or, furthermore, it may be the starting-point of any of these diseases.

While the disease is necessarily a fatal one, it should not warrant us in utterly abandoning any efforts to relieve or arrest its progress. In the early stages, probably the most prominent indications which present are in the use of counter-irritation, with derivatives. As the paralytic symptoms develop, our main resource would consist in attention to diet, and such other measures as would best promote nutrition, and the judicious use of galvanism, which as affecting the bulb, is probably best applied transversely through the mastoid prominences. In addition to this, perhaps direct galvanism through the affected muscles of the fauces and oral cavity might be attended with some benefit. According to Erb,[1] the administration of medicines has never produced the slightest effect, although Gowers[2] suggests the advisability of administering quinine, strychnine, arsenic, phosphorus, nitrate of silver, or morphia and strychnia in combination. When deglutition becomes impossible, the attempt may be made to convey food to the stomach by means of a tube. This, however, is ordinarily rendered impossible by the violent choking and retching which it excites. Hence, rectal alimentation may become necessary. In the later stages of the disease, to overcome pain and sleeplessness, the administration of anodynes and hypnotics is rendered imperative.

Sudden or Apoplectiform Bulbar Paralysis.—This term is used to describe those cases of bulbar paralysis which, while coming on suddenly, are attended oftentimes with somewhat obscure and puzzling symptoms at the onset, and which therefore not infrequently present certain diagnostic difficulties. The term is used as a purely clinical one, in that, while the train of symptoms which these cases present is very similar in character, the pathological lesions vary in different instances.

This is the form of bulbar paralysis, moreover, which is of special interest to the laryngologist, in that the diagnosis must in a very large degree be based upon an inspection of the fauces. The

[1] Loc. cit. [2] Loc. cit., p. 941.

recognition of the special bulbar lesion, however, is at best but a matter of opinion based on a careful analysis of local and general symptoms, and as a rule is only clearly demonstrated upon a post-mortem examination.

We therefore include under this heading cases of bulbar paralysis which are due to hemorrhage, embolism, endarteritis, softening, etc.

As illustrative of the clinical history of the disease, the following cases, which are selected from a number that have been under my own personal observation, are given:

Case I. Unilateral paralysis of abduction from metastatic thrombus. J. W. M., a member of the judiciary in one of our Western States, consulted me on March 27th, 1890, with the following history:

On November 20th, 1889, he retired in his usual health. He was awakened suddenly, in the early morning hours, by something happening which he could not describe. On attempting to rise in bed, he found that he fell over to the right side. There was considerable nausea, and, to allay this, he attempted to drink a little water, but this he found to be an absolute impossibility. He got out of bed with considerable difficulty, and went down-stairs, but he found himself walking with very great effort, and unconsciously turning to the right. He was also very dizzy, and the nausea continued. On further questioning himself as to his symptoms, he found that he was partially paralyzed as to motion over the whole of the right side, from the crown of the head to the soles of the feet. On the left side there was paralysis of sensation to this extent: that while the tactile sense was not destroyed, his appreciation of heat and cold was absolutely gone. There was also some slight dyspnœa, although his voice was unimpaired as far as he knew, except that the vocal tones were somewhat peculiar. This latter symptom, of course, was due to paralysis of the palate.

There was no facial paralysis as far as he knew—that is, the face was not drawn, yet it felt heavy and stiff over the right side. There was also some impairment of sight, in that, as he expressed it, the eyes did not focus well. He could neither sneeze nor cough, although he could clear his throat with some little difficulty. The tongue was protruded slightly to the right side. Articulation was not impaired. The sense of taste was notably impaired on the left side of the tongue. As he expressed it, the loss of sensation of taste on the left side extended down to his stomach. He declined to consider himself a sick man, and kept about the house, although it was no small effort to move. The power of deglutition was lost for two days, but he commenced to swallow on the third day. This, however, was accomplished but slowly for some weeks. The motor impairment gradually disappeared, and on the twelfth day he walked down the street, though still with some effort. According to his own story, the impairment of motion lasted only two months, although at the time of his visit to my office, four months after, I could detect still some evidence of motor weakness. While this feature of his paresis improved rapidly, the sensory paresis of the left side seemed to improve quite slowly, and at the end of four months there is still a notable failure to appreciate the sensations of heat and cold.

When I first saw this patient, he consulted me on account of an antrum disease, and he seemed to think that all his other symptoms had completely

disappeared, and really described them to me as a curious experience which had happened to him some months before. I found him to be a man in almost perfect health, in whom a close examination failed to reveal any departure from the normal condition, with the exception of the symptoms above noted, of slight sensory paresis of the left side. He went through the ordinary muscular tests of spinal and bulbar disease, without revealing any impairment of power. There were the characteristic symptoms of disease of the left antrum, and this was successfully operated upon by opening this cavity through the alveolus. A large amount of pus was discharged and a Bordenave tube inserted.

An examination of the larynx showed the right chord lying motionless in the median line; in other words, there was complete paralysis of abduction of the right vocal cord.

It would have been interesting to have noticed, whether there was an anæsthetic condition of the mucous membrane of the larynx. This, however, was not elicited, owing to a somewhat irritable condition of the fauces.

The first question that arises here is as to the cause of the bulbar disease, and its possible connection with the suppurative disease of the antrum. This man, as I have said, was in the enjoyment of perfect health, and there was no obvious physical trouble which should have led to the development of bulbar disease, other than the suppurative process in the antrum.

Dr. M. A. Starr, who saw this case with me, was disposed to agree with me in the idea that there was a thrombosis of one of the small arteries of the medulla, and that this thrombosis led to some meningeal disturbance, extending to the cerebellum, which would account for the loss of co-ordination with the motor and sensory impairment which characterized the early days of his attack.

Case II. Paralysis of the pharyngeal constrictors as the result of endarteritis deformans.

A. S. R., aged 52, merchant, consulted me, May 9th, 1888. Up to ten weeks before he consulted me, he was perfectly well. On rising in the morning he found that he could not speak. There had been no premonitory symptoms, no giddiness, and no headache. On attempting to eat, he found that he could not swallow easily. Solid food seemed to be arrested in the throat, and to cause choking. There was a slight weakness of the right hand, but no other paralytic symptom in the extremities. He immediately began to be troubled with salivation, the tongue felt swollen, the lips could not be approximated to whistle or to say O. After this he went to Washington and Fortress Monroe, and seemed to improve in the warmer climate. About a week before he consulted me, he took cold, and the hoarseness, which had almost totally disappeared, and his difficulty in swallowing, which during this interval had not troubled him, returned. At the time of examination, both symptoms seemed ameliorated, but were still present. Since the attack, he had lost flesh and strength. There were no cardiac, renal, or pulmonary symptoms. On examination, the larynx was normal, there was no difference in sensation between the two sides of the palate. The pupils were sluggish to accommodation, but reacted perfectly to light. There was no loss of power in the extremities, and tendon reflex was normal. There was no facial paralysis, no deviation of the tongue; and no intra-thoracic trouble was found on physical examination; the retinæ were normal, and the field of vision not limited. There was sluggish movement of the palatal and pharyngeal muscles on both sides. This patient was put under the administration of strychnine, and directed to return to Richmond and Washington for two months and abandon any idea of at-

tending to business. At the end of this time I saw him again, and discovered a very satisfactory state of improvement, although there was still evidence of mild faucial paresis. This improvement has slowly continued, and he has assumed charge of his business in Maine. My diagnosis in this case was deforming endarteritis, probably the result of a gouty habit, there being no reason to suspect syphilis. The prognosis given was a guarded one, and made dependent on the careful regulation of his mode of life in the future.

CASE III. Paresis of the palatal and pharyngeal muscles as the result of obliterating endarteritis in a gouty patient.

H. M., aged 62, consulted me, November 14th, 1886, with the history of rising in the morning a week previously with a feeling of general malaise and weakness of the limbs, which compelled him to lie down again. His speech was slow and thick, and articulation difficult. On his breakfast being brought to him in bed, he found considerable difficulty in swallowing both solids and liquids, although he managed to pass the softer kinds of food into the stomach, while the liquids were regurgitated into the nose. An examination of this patient, when I saw him, revealed the following conditions. The uvula was bent to the left, narrowing the palatal arch on that side, while the right arch was broader than normal. On protrusion of the tongue, the tip was turned to the right side. In attempting to stand or hop on one leg, a notable weakness of the left side was ascertained. This patient always enjoyed fairly good general health with the exception of occasional attacks of gout from which he had been a sufferer many years. He was under my care for two months, and made a fairly good recovery under the administration of general tonics, strychnia, and lithia, although even up to the present time there is a noticeable impairment in his articulation and lack of vigor in locomotion. The diagnosis in this case was obliterating endarteritis of one of the small vessels distributed in the medulla, undoubtedly the result of the gouty habit.

CASE IV. Unilateral paralysis of the palatal and pharyngeal muscles as the result of bulbar hemorrhage.

H. L., German, aged 63, a merchant, consulted me on the 19th day of August with the following history: Three months before, he arose in the morning with a feeling of general malaise, weariness on exertion, with a notable difficulty of articulation, and the feeling of an exceedingly thick tongue. On attempting to swallow at breakfast, the bolus lodged in his throat, giving rise to a threatened attack of suffocation until the mass was expelled. Fluids passed to the stomach slowly and with difficulty. The condition improved somewhat, and until he consulted me when he was able to take a fair amount of nourishment, although always with exceedingly great difficulty. An examination of the fauces showed the uvula slightly tilted to one side, while, on protrusion of the tongue, the tip was bent to the same side. His speech was slow and articulation thick. On pricking the pharynx and palate on one side, reflex contractions were excited with considerable difficulty, while on the other side the response was prompt. Nothing was noticeable in his movements in walking other than that they were slow and apparently feeble. On directing him to hop on one leg and then on the other, it was ascertained that it was impossible for him to stand or hop on the left leg. Treatment in this case was absolutely of no avail. The disease progressed slowly until the following spring, when he died of inanition. During the last three months of his life the only nourishment he received was administered through an œsophageal tube, deglutition being impossible. My diagnosis in this case was hemorrhage into the medulla near the nucleus of the glosso-pharyngeal, pneumogastric, and

hypoglossal nerves, with subsequent softening, invading the restiform and olivary bodies.

Cases similar to these have been reported in medical literature by Hughlings Jackson,[1] Proust,[2] Senator,[3] Biermier,[4] Dumenil,[5] Eisenlohr,[6] and others.

Jackson reports four cases, in two of which post-mortem examinations were made. In one of these, in which there was paralysis of the left half of the tongue and palate, the examination showed softening of the medulla, in the region of the anterior pyramid. In the other, there was paralysis of the sixth, seventh, and eighth nerves, as the result of extensive disease in the right side of the medulla and pons.

In Proust's case, the prominent symptom was dysphagia, in connection with complete paralysis of the vocal cords. The autopsy showed thrombosis of the left vertebral artery, obliteration of the posterior inferior cerebellar artery, and softening of the floor of the fourth ventricle, in the region of the nucleus of the hypoglossal, accessory, and facial nerves.

In Senator's case, the symptoms were somewhat similar, while the autopsy showed an area of softening involving the olivary body, the nucleus of the hypoglossal, and a portion of the fibres of the vagus.

In Biermier's case, there was right recurrent paralysis in the larynx, paresis of the right side of the palate, and analgesia of the mucous membrane of the right side of the mouth, and of the integument about the right eye. The diagnosis was thrombosis of the posterior cerebral artery, with softening of the medulla.

Dumenil's report is of twelve cases of paralysis of the palate, many of which were attended with paralysis in other regions. His eighth case is of special interest, in that the paralysis was confined to the palate alone, the patient dying of cancer of the pylorus. The autopsy revealed an area of softening in the right restiform body, about the size of a pea.

Eisenlohr's case was a male aged thirty-three, who suffered from complete recurrent paralysis of the left side of the larynx, and paralysis of the left side of the palate and pharynx. There was also diminished sensibility of the skin, over the left trigeminus distribution. The post-mortem examination showed degeneration of the bulb, and upper part of the cord.

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[1] London Hosp. Reports, 1864, vol. i., pp. 361, 368. Ibidem, 1867, vol. iv., pp. 314, 318.

[2] Cited by Hallopeau: "Des Paralyses bulbaires," Paris, 1875, history 23.

[3] Arch. f. Psychiatrie, vol. xi.

[4] Cited by Gottstein: "Die Krank. des Kehlkopfes," Leipsic und Wien, 1888, p. 305.

[5] Arch. générales, 1875, vol. i., p. 385. [6] Deut. med. Woch., 1886, p. 363.

Other cases have been reported by Ross,[1] Proudfoot,[2] Spaak,[3] Erben,[4] Scheiber,[5] Mackenzie,[6] and others, in which the diagnosis of bulbar disease was based on symptoms, no autopsies having been made.

A prominent point for discussion, of course, in connection with this disease, is upon the question of diagnosis. This is necessarily based on the existence of a paralysis coming on suddenly, and which involves muscular structures which receive their innervation from the ganglia which are located in the floor of the fourth ventricle. This paralysis may be unilateral or bilateral, depending upon the involvement of one or both sides of the bulb. It may confine itself to half the palate, as in the unique case reported by Dumenil, or it may involve the movements of the larynx, pharynx, palate, and tongue, which are governed by the bulbar ganglia.

The attack comes on suddenly, and usually during sleeping hours. The patient wakens in the morning, with a feeling of malaise, indisposition to move, dizziness, and perhaps headache, with vomiting; but his attention is first called to a condition of paralysis, usually in the attempt to swallow, which is found to be either difficult or impossible. While there is no paralysis of the muscles of the extremities, their movements are, at the onset of an attack, very liable to be affected, probably as the result of some disturbance of the circulation in the anterior pyramids. This symptom, however, usually passes away after a time. If the muscles of the larynx are affected, the paralysis is usually complete of one or both sides, although a number of instances of simple abductor paralysis have been reported.

The extent of paralysis in this region can only be determined by laryngoscopic examination.

Paralysis of the palate and pharynx is usually made out on inspection of the parts, and by stimulation with the probe. Unilateral paralysis is indicated by the drawing the palate and uvula, with protrusion of the tongue, to the paralyzed side. Pain, with feeling of stiffness, perhaps, in the region of the nucha, while not a constant symptom, is not infrequently present at the commencement of the attack.

To clearly localize a lesion in the medulla, as the source of paralysis of faucial muscles, will not infrequently present a problem of some difficulty; and yet I am disposed to think, that in the major-

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[1] Canada Med. and Surg. Jour., 1882–83, vol. xi., p. 368. [2] Ibid.
[3] Annal. des Mal. de l'Oreille, 1876, vol. ii., p. 361.
[4] Wien. med. Blätter, 1887, Nos. 1 and 2.
[5] Pesth. med.-chir. Presse, 1888, No. 49.
[6] Trans. Clin. Soc., London, 1886, vol. xix., p. 317.

ity of cases the apoplectiform character of the attack, without loss of consciousness, the general motor disturbance, together with a careful analysis and study of the area of the paralytic invasion, will serve in most instances to make the diagnosis comparatively clear; certainly, a coincident invasion of the muscles of the tongue and pharynx, or of the muscles of the palate and larynx, would indicate a bulbar lesion.

The difficulty of diagnosis occurs in those exceedingly rare instances where the paralytic area is but small in extent.

The prognosis of these cases is usually not essentially grave, in that the disease is not a progressive one, the whole mischief having been accomplished with the first seizure. In rare instances, however, an endarteritis, perhaps, or some other lesion, may set up changes which become progressive, and the disease may go on to a fatal termination.

The treatment of the affection, of course, is purely a treatment of symptoms. The measures to be pursued have already been sufficiently indicated in the discussion on the treatment of progressive bulbar paralysis.

Bulbar Paralysis Due to the Presence of Tumors, Meningitis, etc.—Cases in which faucial paralysis is the result of tumors in the medulla are exceedingly rare. When this occurs, however, it is not ordinarily a difficult matter to locate the lesion in the bulb, although, of course, the recognition of the special form of neoplasm is usually only determined by a post-mortem examination.

The symptoms develop somewhat slowly, and consist usually of some disturbance of vision, with perhaps dilatation of the pupils. There is headache and nausea, with motor and sensory disturbances in the fauces and perhaps other parts, dependent upon the size and location of the growth.

In a case reported by Joh. Erichsen,[1] in connection with certain general symptoms, there was paresis of the right side of the palate, loss of voice, and anæsthesia of the right side of the face, which an autopsy revealed to be the result of a tubercular tumor in the floor of the fourth ventricle, the size of an almond, which covered the right half of the bulb, completely destroying the right restiform body.

In a case reported by Sokaloff,[2] there was weakness of the right arm and leg, defective hearing, right facial paralysis, difficulty in deglutition, deviation of the tongue and uvula to the right, and

[1] Petersburg. med. Zeitschr., 1870, vol. i., p. 105.
[2] Deut. med. Woch. 1886, p. 363.

paralysis of the left vocal chord. Dyspnœa occurred later in the disease. The autopsy revealed a glioma involving the left side of the pons, medulla, and olivary body.

In a case reported by Ollivier d'Angers,[1] the patient suffered from bilateral paralysis of the abductors, dysphagia, spasmodic cough, paraplegia, and weakness of the arms. The post-mortem examination revealed an aneurism of the basilar artery, compressing the olivary body, and the nuclei of the glosso-pharyngeal, vagus, and hypo-glossal nerves.

McBride[2] reports a case in which a carcinoma of the base of the skull gave rise to paralytic symptoms, involving the hypoglossal and glosso-pharyngeal nerves of the left side, left abductor paralysis, and complete anæsthesia of the left half of the larynx.

Jackson[3] reports a case of paralysis of the right half of the tongue, the right half of the soft palate, and the right vocal cord, together with involvement of the brachial plexus. The left pupil was also affected. From the syphilitic history of the case, the lesion was probably of specific origin.

A somewhat similar case is cited by Mackenzie.[4]

Turner[5] reports a case of a child, aged five, that suffered from difficulty in deglutition, and from cough, together with unilateral atrophy of the tongue and paralysis of the soft palate and of the laryngeal muscles. There was also atrophy of the optic nerves, and a weakness and atrophy of the right arm. The history of hereditary syphilis in this case led to a diagnosis of a syphilitic disease of the basilar meninges.

Barlow[6] reports a case with a similar clinical history, due probably to injury to the cervical spine.

In a case reported by Nothnagel,[7] an abscess, originating in the petrous portion of the temporal bone, gave rise to paralysis and atrophy of the left side of the palate, anæsthesia of the left half of the larynx, abductor paralysis of the left vocal cord, dysphagia, and paresis over the distribution of the left facial, abducens, and trigeminus nerves.

We have thus discussed the question of paralysis, as involving the muscular structures of the fauces, due to the various forms of bulbar disease, confining our attention largely to the local para-

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[1] Cited by Gottstein: Op. cit., p. 309.
[2] Cited by Gottstein: Op. cit., p. 311.
[3] Lancet, London, 1886, vol. i., p. 689.
[4] Trans. Clin. Soc. Lond., 1886, vol. xix., p. 317.
[5] Brit. Med. Jour., 1889, vol. i., p. 1,340.
[6] Trans. Clin. Soc. Lond., vol. xxii., p. 322.
[7] Wien. med. Blätter, 1884, No. 9.

lytic manifestations, although it must be borne in mind that in many of the morbid conditions alluded to, and in many of the cases reported, other and prominent symptoms have not been fully discussed, in that our main interest here, has to do with those cases which present to the throat specialist. In this connection we should bear in mind that in many instances an ordinary case of facial paralysis, due to pressure on the nerve trunk as it passes through the aquæductus Fallopii, is attended with paralysis of the levator palati and azygos uvulæ muscles of the same side, as observed by Dumenil[1] and Sanders.[2] This form of palatal paralysis, however, gives rise to no prominent symptoms, and is usually overlooked on account of the more evident pathological condition of the facial muscles.

The paralysis of the palate, complicating disease of the mastoid, as in the case reported by Gairdner,[3] arose in the same way, in connection with facial paralysis.

Sanders[4] reports a case of palatal paralysis, complicating diabetes, which is of special interest in connection with the supposed location of the diabetic centre in the floor of the fourth ventricle.

Herpes of the Fauces.

This affection consists in the development in the mucous membrane of the faucial region of an eruption presenting all the appearances of true herpes. It is, moreover, attended with certain symptoms, both local and constitutional, which render it analogous with herpetic eruptions on the skin. In an exceptionally large experience in throat diseases I have met with a dozen cases which I was disposed to regard as instances of true herpes, although Chapman[5] states that in an experience of six years he has recorded over a hundred cases.

In three of the cases which I have seen the eruption showed itself in the form of herpes iris; that is, there were developed in the mucous membrane small rings of minute papules, partially or completely enclosing a patch of healthy membrane. In another case the small papules seemed to arrange themselves somewhat irregularly in the mucous membrane of one side of the fauces. In another case they formed a line along the junction of the hard and soft palate. These papules manifested no tendency to develop into

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[1] Loc. cit.
[2] Edinb. Med. Jour., 1865, vol. xi., pt. i., p. 141.
[3] Lancet, Lond., 1861, vol. i., p. 479.
[4] Loc. cit., p. 244.
Trans. Amer. Laryngol. Ass'n, 1884, p. 96.

vesicles, but consisted in minute red points in which the membrane was very slightly raised above the surface.

As to what special condition gives rise to the eruption I am somewhat uncertain, but I am disposed to regard it as a localized inflammation of the papillæ of the subepithelial layer of the mucous membrane originating principally in the terminal filaments of the nerves. In those cases in which it took the form of herpes iris, the rings were somewhat irregular in outline, not perfectly continuous, yet approximating sufficiently to an iris-like ring to warrant the name of herpes iris.

The eruption in all the cases that I have seen has been on the soft palate and uvula, and furthermore it has always been confined to one side. The eruption was not usually a continuous one, but the patches would make their appearance, and after a period of from five to ten days would disappear, and recur again after an interval of perhaps a week, or even longer, sometimes remaining absent for months. The same was true of the individual papules: each showed a tendency to come and go independently of its fellows.

The prominent symptoms to which this eruption gives rise are more or less pain referable to the faucial region, constant and somewhat annoying in character, and increased by deglutition. There is a general sense of discomfort about the throat, attended oftentimes with a most intolerable itching about the parts. The minute spots or papules stand out prominently as to color, showing a deep purplish red, in contrast with the pinkish tinge of the healthy membrane surrounding them. They occur on one side of the throat, and are either scattered irregularly or arrange themselves in the form of rings or circles.

I regard the affection as largely a constitutional one, and hence its successful management depends mainly on the internal administration of remedies. The patients usually present decided evidences of the nervous temperament, they are subject to neuralgias, or show hysterical symptoms and all the evidences in appearance and clinical history which go to make up what we call the neurotic habit. Occasionally they are anæmic or chlorotic, or show other evidences of impaired general health.

The treatment from which I have obtained the best results has consisted in the administration of cod-liver oil with barks and iron, in connection with arsenic. These should be given for a considerable length of time until the general health seems fully restored. In addition to this, certain local remedies may be used, in order to give relief to pain and the intolerable itching to which the affection gives rise. For this purpose I have generally found the best relief

from a gargle composed of ten grains of carbolic acid in an ounce of water. This remedy we know acts as a local sedative in addition to its other properties, and it is this effect which is obtained by its use in herpetic sore throat. If the case prove an obstinate one, the individual papules may be cauterized at intervals of a week with either the solid stick of nitrate of silver or with chromic acid.

CHAPTER XXII.

BENIGN TUMORS OF THE FAUCES.

THE faucial region does not seem to afford a favorable site for the development of benign neoplasms; and since medical literature furnishes but a comparatively few reported cases, I have confined my consideration of this subject mainly to a brief *résumé* and analysis of the cases which I have consulted. These will be considered in the following order: First, tumors of the soft palate, uvula, and pillars of the fauces; second, tumors of the tonsils; and third, tumors of the oro-pharynx.

TUMORS OF THE SOFT PALATE, UVULA, AND PILLARS OF THE FAUCES.

PAPILLOMA.—By far the most common form of neoplasm met with in this region is the papilloma which ordinarily attaches itself to the tip of the uvula or to the edges of the soft palate or faucial pillars. These little warty growths may develop without giving rise to any symptoms whatever; indeed, it is by no means an infrequent occurrence to observe, on the tip of the uvula or edge of the soft palate, a small, papillomatous excrescence of the size of a grain of rice, or smaller, of which the patient has been entirely unconscious. In the past few years, in my own private practice, I have removed, perhaps, from ten to fifteen. These have been small, inert, warty growths, which seemed to show no disposition to extend, and presented practically no indications for operative interference other than their mere presence. Occasionally we meet with instances in which the growth shows a tendency to extend, even somewhat rapidly, and has thus attained considerable size. Thus, in a case reported by Lloyd,[1] a papilloma, springing from the right anterior pillar, had, in the course of three months, increased from about the eighth of an inch to nearly half an inch in diameter; while Claiborne[2] observed one in a similar situation which attained the size of the end of the finger. A somewhat sim-

[1] Lancet, London, 1881, vol. i., p. 865.

[2] New York Medical Journal, 1889, vol. xlix., p. 182.

ilar case is reported by Hilton and Wilks,[1] in which the growth sprang from the border of the soft palate. Perhaps the most remarkable of these cases is that reported by Lefferts,[2] in which a papilloma developed on the uvula of a girl aged sixteen, and in eight months had attained such proportions that it extended over the whole of the uvula and to the soft palate, forming a mass from a half to three-quarters of an inch in breadth. Its lateral extension seemed to be apparently permitted, by the fact that it developed on the face of the uvula, since in the case reported by W. F. French[3] a similar neoplasm, having its origin on the tip of the organ, developed downward, forming a long pendulous mass a quarter of an inch in diameter and an inch in length. Semon[4] has also reported two cases, in one of which the papilloma developed on the side of the uvula, and in the other upon the anterior pillar, the cases being respectively sixteen and thirteen years of age.

Even where these neoplasms have attained to considerable size, they have never given rise to any serious symptoms or presented any great difficulty in their treatment. They seem to arise spontaneously and from no apparent cause. Their favorite site is on the edge of the soft palate and uvula, all of these being parts which are subjected to notable activity of functional movement. Especially is this true of the uvula, where the largest growths have developed. When small in size, they give rise to no symptoms; as they increase in proportions, they seem to cause some little irritation of the parts, with cough and slight expectoration, but mainly a mere sense of uneasiness or irritation; although in two cases observed by Cohen[5] the cough seemed to be a somewhat prominent symptom, and at times became spasmodic in character. In French's case the length of the tumor was such as that, projecting into the fauces, it excited nausea and vomiting, especially after eating; while Herzfelder[6] has reported a case of papilloma of the soft palate in a boy aged nineteen, who was the subject of convulsive attacks of a hystero-epileptic character when in a recumbent position. These disappeared completely upon the removal of the growth.

These neoplasms present the ordinary appearances of a papillomatous growth met with in other portions of the mucous membrane, viz., a soft, white, mammillated appearance with the outlines which we recognize as characteristic of this form of growth, a sort

[1] Transactions Pathological Society of London, vol. vii., p. 187.
[2] Transactions American Laryngological Association, 1889, p. 61.
[3] New York Medical Record, 1887, vol. xxxii., p. 813.
[4] St. Thomas' Hospital Reports, 1889, n. s., vol. xiii., p. 126.
[5] "Diseases of the Throat and Nasal Passages," New York, 1879, p. 209.
[6] Wochenbl. d. Z. Wien. Aerzte, 1856, No. 30.

of cauliflower or proliferating contour (see Fig. 33). If there is any question of diagnosis, the microscope will reveal the characteristic structure of papilloma, viz., that each individual papilla is made up of a delicate system of connective tissue supporting a single loop of blood-vessels running its entire length, while the outside of the investment is made up of the epithelium which belongs to the mucous membrane of the part invaded, except so far as this latter may be altered.

The treatment consists in the removal of the neoplasm by means of the scissors or snare, cutting not only through its attach-

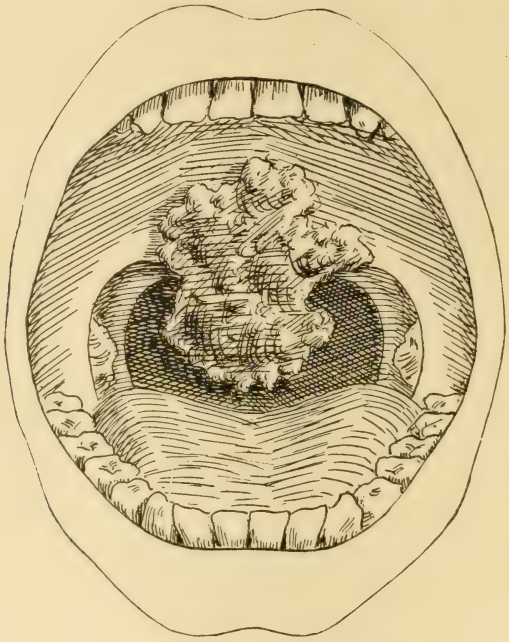

FIG. 33.—Papilloma of the Soft Palate.

ment, but somewhat into the mucous membrane, in order to obviate any tendency to recurrence, and at the same time to avoid hemorrhage, which is far more troublesome where the warty growth itself is cut through than where the larger vessels at its base are severed. Ordinarily, there is no necessity for cauterizing the base, since if the growth is thoroughly extirpated there is no tendency to recurrence.

FIBROMA.—We find but seven instances reported in medical literature of a fibrous tumor developing in this region:

CASE I. Reported by Syme,[1] occurred in a man aged 38, who for some time had complained of something in his throat which gave rise to a sense of un-

[1] The Lancet, London, 1856, vol. i., p. 51.

easiness, with interference with function. Examination revealed a mass projecting into the isthmus from the region of the left tonsil. An incision was made through the mucous membrane directly down upon the tumor, which was subsequently enucleated by means of the finger, with comparative ease. It was ovoid in shape and about the size of a hen's egg, and found to be composed of fibrous tissue.

CASE II. Duchaussoy[1] reports the case of a patient presenting with a history of having complained for some time of uneasy sensations in the region of the fauces, with painful deglutition, and also pain in the left ear, with impairment of hearing. An examination revealed the presence in the right anterior pillar of a hard, dense, resisting tumefaction, which was about the size of a small nut. No operative interference was attempted in this case, and the patient succumbed later. Post-mortem examination revealed the presence of similar tumors on the epiglottis and about the orifice of the Eustachian tube, which the observer states to have been fibro-plastic in character, although the suspicion naturally suggests itself, to any one reading the history of the case, that this may have been a case of multiple sarcoma.

CASE III. Reported by M'Leod,[2] was that of a male æt. 21, who for ten months had been aware of the presence of a growth in the soft palate and right side of the pharynx. The neoplasm had during the last three months become greatly augmented in size. It was removed by lateral pharyngotomy and was found to be a myxo-fibroma. The recovery was complete.

CASE IV. Reported by Murchison:[3] A female aged 25 presented with the history of a tumefaction in the fauces, which had existed for twelve months, and which on examination had attained the size of a marble. It was embedded in the tissues of the soft palate, between the uvula and the left tonsil. It had given rise merely to difficulty in deglutition. The growth was easily enucleated after an incision through the mucous membrane.

CASE V. Reported by Birkett:[4] This was the case of a man aged 64, who presented for a sore throat, which on inspection was found to be due to a large, rounded tumor extending completely across the faucial arch and resting upon the dorsum of the tongue. On examination, it was found to be pedunculated, attached to the right pillar of the fauces and uvula, and freely movable. It was successfully excised, with no bad symptom and but trifling hemorrhage, and reported as a carcinomatous tumor composed of fibrous, nuclear bodies and granular cells. This was of course a fibrous tumor.

CASE VI. Reported by King:[5] A male aged 28 presented with a history of a growth in the fauces, which had existed for some time, but for three months had given rise to notable interference with deglutition, together with a certain amount of dyspnœa. When examined, it completely filled the faucial region, having attained about the size of an apple, and extended downward toward the larynx. It had also produced some external deformity in the cervical region. It was situated in the substance of one side of the soft palate, and protruded into the cervical tissues. Access to the tumor was obtained by an incision through the cheek from the angle of the mouth to the inferior maxilla, which was cut through by the saw. The body of the jaw being depressed, the tumor was dissected out from its attachments. The operation was attended with excessive hemorrhage, which necessitated the ligature of the common carotid

[1] Dictionnaire Dechambre, art. "Amygdalite."

[2] Lancet, London, April 13th, 1889.

[3] Monthly Journal Medical Sciences, London and Edinburgh, 1852, vol. xiv., p. 490.

[4] Lancet, London, 1852, vol. i., p. 490. [5] Lancet, London, 1871, vol. i., p. 264.

artery. The operation seems to have been successful, although the patient subsequently succumbed to erysipelas.

CASE VII. Ott[1] reports a case of this disease observed by Sabatier, occurring in a male aged thirty-two, who for three years had suffered from the feeling of a foreign body in the throat. Examination revealed a considerable prominence in the submaxillary region on the right side, caused by a large tumor of the soft palate, situated in the right half of this structure, and almost completely filling the mouth.

Access to the growth was obtained by division of the lower jaw, after which the neoplasm was removed. A microscopic examination revealed the growth to be of a fibrous character.

The clinical significance of this form of neoplasm seems to be quite clearly indicated by the cases reported above. As occurring in the soft palate, these tumors present no notable difference from the same variety of growth in other portions of the body. They develop somewhat rapidly, and give rise to no local symptoms other than those which are adventitious and mechanical. Their removal seems to be attended with no especial dangers where the operation is undertaken sufficiently early.

ANGIOMA.—Cases of this form of neoplasm have been reported by Scarpa,[2] Ellerman,[3] and Phillips.[4]

In Scarpa's case the tumor made its appearance in early life, on the right palatine arch, and at the age of forty-seven had attained the size of a chestnut. It was easily removed by the scissors, and there was no recurrence. The operation was attended with considerable hemorrhage, which was controlled by pressure and styptics.

Ellerman's case was that of a lady aged twenty-eight, in whom a tumor made its appearance at the root of the uvula, forming a pendulous mass which gave rise to some local irritation with increased flow of saliva. It was easily removed by the galvano-cautery.

Phillips' case occurred in a man aged thirty-nine. The tumor made its appearance on the uvula, and at the end of eleven months invaded the whole organ, increasing it to several times its normal size. The dilated blood-vessels also extended somewhat on to the soft palate. In this case deglutition seems to have been so difficult and painful as to notably interfere with the general nutrition. This growth was also removed by the galvano-cautery. There was no recurrence.

In addition to the above, we find observations of similar neoplasms occurring on the hard palate by Vidal de Cassis,[5] Gross,[6] Bate,[7] and Leonhard.[8]

It is difficult to assign any cause for these growths, although Ellerman suggests that they may have their primary origin in a papilloma which becomes transformed into an angioma as the result of negative pressure in the act of deglutition. They are composed

[1] Thèse de Paris, 1880, No. 26, p. 44.
[2] "Opusc.," ed. 1825, ii., p. 193.
[3] Brit. Med. Jour., 1888, vol. i., p. 131.
[4] Med. Rec., N. Y., March 12th, 1887, p. 293.
[5] "Path. Ext.," vol. iii., p. 502.
[6] "System of Surgery," vol. ii., p. 467.
[7] Amer. Jour. Dent. Sc., 1855, p. 150.
[8] Schmidt's Jahrbücher, 1839, vol. xxii., p. 210.

almost entirely of a network of blood-vessels bound together by a delicate connective tissue. The walls of the blood-vessels are exceedingly thin, also the outer investment of the tumor; hence, their surface is very sensitive, and their presence gives rise to more or less pain in deglutition, with faucial irritation.

The diagnosis is easily made on inspection. The vascular character of the tumor makes itself known by the nodulated outlines, soft yielding consistency, sensitiveness to the touch, and the peculiar purplish-blue color. In Phillips' case the clinical history led to the view that the tumor was a manifestation of syphilis. This mistake, however, need rarely be made.

The only indications for treatment consist in the radical removal of the growth; and considering its vascular character and the troublesome hemorrhage which may attend the operation, the galvano-cautery loop would seem to afford the safest method of complete extirpation, with the avoidance of troublesome complications in the way of hemorrhage. In Leonhard's case the angioma apparently invaded both the hard and soft palate, giving rise to a tumor which nearly completely filled the mouth. In the removal of this the hemorrhage became so excessive as to render it necessary to abandon the primary operation, the wound being plugged for three days before this was resumed, after which the growth was removed by means of the ligature.

In all the cases recorded, the operation has been successful and no recurrence has been reported.

ADENOMA.—This form of neoplasm is of comparatively frequent occurrence in the palate—a fact which may probably be explained by the large number of muciparous glands with which the mucous membrane of this region is endowed. Instances of this form of growth have been reported by Marjolin,[1] Michon,[2] Nélaton,[3] Bauchet,[4] Nadaud,[5] Laugier,[6] Robin and Rouyer,[7] Rouyer,[8] Fano,[9] Ansiaux,[10] Deneffe,[11] Letteneur,[12] Deprès,[13] Python,[14] Smith,[15] Barrière,[16] Dubreuil,[17] Mormiche,[18] Tillaux,[19] Hutchinson,[20] and Natier.[21]

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[1] Bull. de la Soc. de Chir., 1851–52, vol. ii., p. 79.
[2] Bull. de la Soc. de Chir., 1851–52, vol. ii., p. 434. [3] Ibid., pp. 436 and 437.
[4] Monit. des Hôpitaux, 1853, p. 1134.
[5] Bull. de la Soc. anat., 1856, vol. xxxi., p. 119.
[6] Monit. des Hôpitaux, May 10th, 1856. [7] Monit. des Hôpitaux, 1856, p. 441.
[8] Monit. des Hôpitaux, 1857. [9] Th. d'Agrég., 1857.
[10] Presse méd., 1863. [11] Bull. de la Soc. méd. de Gand, 1865, xxxii., p. 63.
[12] Arch. gén. de Méd., 1871, vol. i., p. 529.
[13] Bull. de la Soc. de Chir., 1874, p. 371. [14] Thèse de Paris, 1875.
[15] New York Medical Record, 1877, vol. xii., p. 236. [16] Thèse de Montpellier, 1878.
[17] Gaz. médicale de Paris, 1883, p. 373. [18] Thèse de Paris, 1883.
[19] Gaz. des Hôpitaux, 1885, p. 257.
[20] Trans. Path. Society of London, 1886, vol. xxxvii., p. 490.
[21] Revue mens. de Laryng., 1887, vol. vii., p. 617.

In the same category we may place the cases of fibro-adenoma reported by Horteloup [1] and Dobson,[2] in that, from a clinical standpoint, the disease follows the same course essentially as that of adenoma. The same can be said of the cases of adeno-enchondroma reported by Trélat [3] and Poncet.[4]

Etiology.—We can assign no cause for the development of these tumors, and can only say that the disease seems to belong essentially to adult life, in that in the cases above reported, in the very large majority of instances, they are met with in the three decades included between the ages of twenty and fifty. It also occurs more frequently among females than males, in the proportion of about two to one.

Symptomatology.—These growths develop somewhat slowly, and during their progress apparently give rise to no notable symptoms until they have attained such size as to interfere with the normal function of the parts. The first symptom to which they give rise is merely that of fulness in the throat, and possibly some interference with the act of deglutition. Pain is occasionally present, due perhaps to pressure on the terminal filaments of the nerve, although as a rule this symptom is absent. The voice is interfered with, according to the size of the neoplasm. If the tumor develop upon the posterior surface of the palate, as occurred in Tillaux's case, nasal respiration is interfered with. In this case hemorrhage also seemed to be a notable symptom, due probably to an erosion of the turbinated tissues by the pressure of the growth. Respiration also may be interfered with if the tumor project backward into the fauces in such a manner as to obstruct the entrance of air into the larynx. This was a notable symptom in Letteneur's case. Slowness of growth seems to be characteristic of this form of neoplasm. Thus, in Dobson's case, at the end of eight years the growth had attained the size of a hen's egg; while in Letteneur's case the tumor was extracted after a duration of sixteen years, measuring at that time two and one-half by one and three-quarters inches. In Michon's case, in ten years the size is reported to have increased from that of a nut to that of an egg. In Natier's case the growth was not discovered until it had attained the size of a pigeon's egg. It then remained quiescent for four years, and in the subsequent five years about doubled in size.

These growths are usually sessile in form and contract no adhesions to the mucous membrane, though in Michon's case the

[1] Union médicale, 1871, 3d series, vol. xii., p. 486.
[2] St. Thomas' Hospital Reports, 1875, n. s., vol. vi., p. 36.
[3] Bull. de la Soc. de Chir., 1877, vol. iii., p. 714.
[4] Gaz. des Hôp., June 19th, 1888.

growth was somewhat pedunculated. The surface of the tumor ordinarily shows no tendency to morbid changes, and is not usually even eroded by contact with neighboring parts, although in Hutchinson's case the surface of the growth was deeply ulcerated.

Pathology.—Adenomata of the mucous membrane have their starting-point generally in certain hypertrophic changes setting in in the normal glandular structures of the part in which they arise. The soft palate being very richly endowed with lymphatics, we naturally find an adenoma of this region containing a considerable amount of this tissue. The framework of the tumor is made up of a delicate stroma of connective tissue supporting a large number of acini. The spaces between these acini are filled in with lymphatic tissue, the proportion of gland tissue and lymphatic tissue varying in individual cases. Thus, in Natier's case microscopic examination showed the growth to be composed entirely of lymphatic tissue, although we must naturally conclude, from the clinical history of the case, that if other portions of the tumor had been examined, gland structure would have been discovered. In some instances, the acini, becoming dilated, assume the character of cysts, with detached epithelium floating about in the cyst contents. Near the surface of the growth we find the fibres of connective tissue ranging themselves more closely, in such a manner as to form practically an investing membrane, while outside of this we find the tumor covered by normal mucous membrane. According to Delucé,[1] the origin of the growth is primarily in an obstruction of the orifice of one of the muciparous glands, resulting in dilatation. This is followed by certain morbid changes, in which hypertrophy of the gland structures becomes a prominent feature.

Diagnosis.—The main difficulty which is met with in the recognition of these tumors is in the differential diagnosis between an adenoma and a fibroma. We are aided somewhat here by the clinical history of the case, in that a fibroma develops somewhat rapidly, interferes more notably with function, and is usually more painful. As regards the outline of the growth and its density, there is very little difference between the two varieties of neoplasm. They are hard, dense and resisting to the touch, and irregularly rounded in outline. Moreover, we remember that, whereas a fibroma is an exceedingly rare disease, an adenoma is one of the most common forms of neoplasm met with in the soft palate. Age and sex, furthermore, aid us somewhat in our diagnosis, in that the adenoma is more frequent among females than males, and is usually met with between twenty-five and fifty; whereas the fibroid belongs usually to an earlier decade.

[1] Bull. de la Soc. anat., 1852, vol. xxvii., p. 18.

The question of malignant disease, of course, occurs to us in connection with all forms of tumors, and must be decided on the ordinary clinical grounds of age, together with the tendency to the development of ulceration and painful symptoms and secondary infiltration of the cervical glands.

Prognosis.—This form of growth possesses no grave symptoms, in that the neoplasms usually are amenable to simple operations, and after removal show no tendency to recurrence. I find no fatal case of this disease recorded in literature. The question suggests itself here, perhaps, as to whether there may be any tendency in an adenoma to undergo malignant degeneration. When we consider the long duration of some of these cases, any such tendency would seem to be entirely absent; although in Depres' case the tumor was found, after extirpation, to contain sarcomatous elements, which led Coyne[1] to suggest that this may have been the result of degenerative changes. Coyne goes on to state, however, that the firm fibrous capsule which invests this form of tumor presents a barrier to any tendency to generalization.

Treatment.—The only indication for treatment is in the removal of the neoplasm by surgical interference. This consists in cutting down upon the growth and enucleating it. The only variations in the operation are dependent upon the size and location of the neoplasm. If the growth is large, it is better to make an elliptical incision, in order to provide against any redundancy of the mucous membrane that might be left after the extirpation of the growth. The operation usually is attended with no special dangers, although in Dubreuil's case, in the course of the operation, it became necessary to ligate, first, the common carotid, and subsequently the internal and external carotids, together with the superior thyroid artery. It is interesting to note, in connection with this case, that, although the complications interfered with the successful extirpation of the growth, it subsequently atrophied, probably as the result of the ligation of the arteries. Of course these operations are usually done under the administration of anæsthetics, although that general anæsthesia is not always necessary is shown by the success of Tillaux in removing an adenoma from the posterior surface of the palate by the use of local anæsthesia by means of cocaine. In Dobson's case, the tumor projected so far into the cervical region as to necessitate external incision.

DERMOID TUMORS.—Tumors of this character are to be regarded merely as developmental abnormalities, and do not belong especially to any particular tissue or region of the body. Hence, their occurrence possesses no particular pathological significance;

[1] Gaz. méd. de Paris, 1874, p. 386.

they are only interesting from a clinical point of view, or possibly in a study of teratology.

A large proportion of these cases have been discovered in post-mortem examinations of abortions or premature births. It would seem that those cases which have been observed in fœtal life were extensive in character and did not belong especially to any region of the fauces, but really involved quite general attachments. This, perhaps, is to be explained by the fact that where the growth is so extensive the result necessarily will be the death of the fœtus *in utero*. In many of these cases the faucial tumor occurred in connection with other deformities, such as cleft palate, club-foot, etc.

In a somewhat exhaustive study of this subject by Arnold,[1] a compilation is made of thirty-eight cases of dermoid tumors involving the fauces. Seventeen of these were instances of premature delivery, the child being born dead, while quite a large proportion of the remainder died at birth or a few days later.

The following instances have been reported in medical literature of the observation during life of this very curious form of neoplasm in this region:

CASE I. Reported by Legroux:[2] A male child two days after birth was seized with an attack of severe dyspnœa, which on inspection of the fauces was found to be due to the presence of a small rounded tumor attached by a stout pedicle to the right anterior pillar. It was easily removed, and found to consist chiefly of adipose tissue, contained in the interspaces of a fibrous matrix. In the middle of the pellets of fat thus formed were fragments of cartilage, some of which showed points of ossification. In the centre of the tumor was a cystic cavity containing a glairy, sticky liquid, without smell or color. The wall of this cyst was lined with integument containing sebaceous and sweat glands and elastic tissue.

CASE II. Reported by White:[3] This was a female child aged 3, which was brought to the hospital, complaining of difficulty in deglutition, which had slowly developed for some time previously. An examination of the fauces showed the existence of apparently an immensely elongated uvula, but a closer inspection revealed a tumor about two inches in length and the size of the forefinger, which was attached to the upper surface of the soft palate. It was ligatured and finally cut out. Its surface was composed of an integument containing hairs with sweat glands and sebaceous follicles. Its interior contained fibrous and adipose tissue with traversing plates of cartilage.

CASE III. Reported by Wagner:[4] A female aged 20 presented with a history of throat trouble dating back two weeks. An examination of the fauces revealed this to be due to the presence of a pedunculated tumor attached to the upper surface of the soft palate near the median line. It was about seven-eighths of an inch broad, three-quarters of an inch long, and about three-sixteenths of an inch thick. The growth was dragged down, and its attachments

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[1] Virchow's Archiv, vol. cxi., p. 176. [2] Bull. de la Soc. anat., 1867, p. 10.

[3] Path. Soc. Trans., London, 1881, p. 201.

[4] N. Y. Med. Record, 1881, vol. xx., p. 77.

separated by means of the knife. This was accomplished with considerable difficulty on account of the toughness of the growth, and furthermore was attended with considerable hemorrhage. An examination showed its surface to be composed of cutaneous tissue containing glands and hair follicles, while within the mass were found three plates of cartilage separated by fibrous tissue, together with a certain amount of adipose tissue.

CASE IV. Reported by Otto:[1] This was a case in which a tumor the size of a hazelnut was observed in a child at birth, giving rise to such severe dyspnœa as to demand immediate operation, which was performed seventeen hours after birth. The pedicle was found to spring from the posterior surface of the palate upon the left side.

CASE V. Reported by Goschler:[2] This was a case in which a pedunculated tumor the size of a hazelnut was discovered in the fauces of a child ten days after birth. At this time nothing was done, but six months later, when the child commenced to suffer from attacks of dyspnœa, the growth was removed, its attachment probably being to the upper surface of the soft palate. The case is interesting in that Goschler reports a recurrence having taken place twelve days later, for which nothing was done, as there were no urgent symptoms.

It is difficult to understand how a tumor of this sort should recur, and it would seem that a more probable explanation here was that the whole of the growth was not removed by the operation.

CASE VI. Reported by Arnold and Schutz:[3] A female aged 13 presented with a history of throat trouble dating back to infancy. At the age of two, a physician had discovered the presence of the neoplasm. As the child developed, the symptoms seemed to abate; hence nothing was done. When first seen by Schutz, there was a tumor the size of a pigeon's egg attached to the left side of the posterior surface of the palate, which gave rise to nasal stenosis and impairment of voice tones. It was removed by the snare, and found to be of the usual form, being covered with skin containing hair and sebaceous follicles, while the pedicle contained cartilaginous plates.

In all the above instances the growth arose from the soft palate. They may also have their attachment to the bony structures; thus:

CASE VII. Mauche[4] reports the case of a dermoid tumor occurring in a child at birth, which, springing from the hard and soft palate, projected into the mouth and naso-pharynx, nearly filling those cavities. It was successfully removed, but the child died nineteen days later. The growth was of the usual kind, but was interesting from the fact that the rudimentary sexual organs were found in a furrow on the surface of the growth.

Instances of somewhat similar cases have been reported by Kidd[5] and Clerault.[6] In these latter instances the growth was of a more sessile character and attained still larger proportions.

[1] Virchow's Archiv, vol. cxv., p. 242.
[2] Arch. für klin. Chir., vol. viii., p. 478.
[3] Virchow's Archiv, vol. cxi., p. 180.
[4] Berliner Dissertation, 1882.
[5] Dublin Hosp. Gaz., 1856 p. 82.
[6] Bull. de la Soc. anat., 1874, p. 380.

Aside from these considerations, the clinical significance of a tumor in this region is practically the same as that of a similar growth from the soft palate. Kidd's case was one of special interest, in that the growth not only attained a large size, but contained, in addition to cartilage and bone, four inches of a double intestinal tube with a single mesentery, together with rudimentary generative organs.

The origin of this form of tumor is in all cases to be found in some error of development during fœtal life, which may result in a neoplasm which has attained sufficient size at birth to manifest itself by notable symptoms, as in Legroux's case. In White's and Wagner's cases the tumor also was probably of congenital origin, in which the progress was so slow that only at the end of three years in the one case and twenty in the other did it attain a sufficient size to make its presence felt. Schutz's case also was without doubt congenital.

The growth is always pedunculated, its outer investment being formed of ordinary integument, containing hair follicles, sebaceous and sweat glands. Its internal contents are made up mainly of fat, with muscular tissue, cartilaginous plates, and occasionally osseous tissue scattered here and there.

The symptoms to which they give rise are purely mechanical, in that they merely cause a certain amount of interference with the normal functions of the parts in deglutition and respiration.

The diagnosis ordinarily should be a comparatively simple matter. It is a soft-looking, white tumor, the surface of which has the gross appearances of integument, moistened by the mucus in which it is bathed. I know of no other faucial tumor which presents these appearances. In addition to this, I know of no pedunculated tumor in the fauces of congenital origin other than the dermoid variety. They are usually removed by the scissors, and show no tendency to recurrence, as there is nothing in their pathological character which leads to a redevelopment of a similar neoplasm if it has been once thoroughly extirpated. The only exception to this rule which has been reported, Goschler's case, has already been commented on.

CALCAREOUS DEGENERATION, OR PALATOLITHS.—Anselmier[1] reports two very curious cases of this affection involving the soft palate. In one case a boy aged 16 presented with a history of difficulty of deglutition and respiration which had lasted a considerable time. He found two masses on the soft palate, one on either side of the uvula, about the size of a hazelnut, which on probing through the dilated mouths of the palatine glands he found

[1] Union méd., 1856, p. 509.

to be calcareous. He inserted a tampon saturated with dilute sulphuric acid into these recesses, with the result of the complete dissipation of the calcareous masses. His other case occurred in a man aged 25, in whom he observed three of these masses. The same treatment was successful in this case. Paget,[1] in commenting on these cases, suggests that these formations occurred in the palatine glands and were analogous to salivary calculi

Tumors of the Tonsil.

As we have already learned in a previous chapter, the tonsil is formed in fœtal life by the meeting of the hypoblast, coming up from the intestinal tract, and the epiblast, pouching in through the oral cavity, and, thus being the meeting-point of two forms of embryonic tissue, should afford an exceedingly favorable site, acaccording to Hingston Fox,[2] for the development of neoplastic growths—a view which is re-enforced somewhat when we consider the peculiar proneness to morbid changes which is characteristic of these organs. Clinical experience, however, teaches us that benign neoplasms are comparatively rare in the tonsils. The explanation of this undoubtedly lies in the fact that the activity of morbid processes in the tonsils belongs to the earlier period of life, and furthermore that in adult life the lymphatic tissue which composes these organs undergoes certain retrograde changes in the nature of an atrophy, as the result of which they either completely disappear or become masses of inert tissue.

Fibroma.—Considering the character of the tissue and its activity in early life, we might perhaps conclude that it would naturally afford a favorable locality for the development of connective-tissue growths; and as a matter of clinical observation we find that many of the tumors which occur in this locality are fibroplastic in character. Medical literature furnishes so few instances of neoplasms in this region that it seems best, perhaps, to give a brief *résumé* of each case:

Case I. Reported by Lefferts:[3] A male aged 55 had been conscious for many years of the existence of a growth in the fauces which had given rise to difficulty in deglutition, and latterly to interference with respiration. He declined surgical relief until these symptoms had increased to such an extent as to render aid imperative. The growth was of a dense, resisting character and, springing from the right tonsil, extended across the isthmus nearly to the opposite side. Its attachment seemed to cover nearly the whole area of the

[1] St. Bartholomew's Hosp. Reports, 1886, vol. xxii., p. 324.
[2] Jour. of Anatomy and Physiology, 1885–86, vol. xx., p. 559.
[3] Trans. of Amer. Laryngological Ass'n, 1889, p. 62.

tonsil. The wire loop of the écraseur was placed around it, and the tumor excised without hemorrhage.

CASE II. Reported by Curling:[1] A male aged 51 had been conscious of the presence of a growth in his fauces for twelve months, which latterly had grown somewhat rapidly, although at the time it came under observation it encroached quite extensively on the oral cavity, pressing upon the hard palate. Access to the tumor was gained by an incision through the cheek from the angle of the mouth to the masseter muscle, and the growth extracted by slow écrasement, the ligature being placed in position and allowed to remain for thirty-six hours. The growth was found to be a fibroma, somewhat sessile in character, and springing from the deep tissues of the tonsil with adventitious attachments to the mucous membrane of the soft palate.

CASE III. Reported by Julia:[2] This case was that of an adult male in whom the surgeon discovered, somewhat accidentally, the existence of a tumor the size of a walnut attached to the left tonsil. It was freely movable and could be swallowed or thrown forward on to the tongue with equal facility. It had given rise, however, to symptoms of such a trivial character that the patient did not consider it of a sufficiently serious nature to seek advice for it. Indeed the patient, while conscious of the existence of this movable mass in his throat, seemed to think that it was natural. It was removed by the scissors and found to be a fibroma.

CASE IV. Reported by Bourdon:[3] In this instance the tumor had existed for five years, and had attained such proportions as to almost completely fill the fauces. After removal, a microscopic examination revealed the fact that the bulk of the growth was made up of fibrous tissue, although containing a large number of cysts. It also showed evidence of a number of hemorrhages in the interior.

CASE V. Reported by Masse:[4] This was the case of an adult male in whom the surgeon discovered, somewhat accidentally, a small tumor attached to the lower third of the left tonsil by a small pedicle the size of a goose-quill. It had given rise to faucial irritation with cough. It was excised and found to be composed of fibrous tissue, and was somewhat vascular in character.

CASE VI. Reported by Lannois:[5] A male 26 years of age had been conscious of the presence of a growth in his fauces for six years, which interfered somewhat with deglutition, and also apparently gave rise to some obscure neuralgic pains. An examination revealed the existence of a tumor an inch long and half an inch in diameter, attached apparently to the central portion of the right tonsil by a pedicle a fifth of an inch in length. It was removed by the scissors and found to be a fibroma.

CASE VII. Reported by Koch:[6] A female aged 22 had for three years been conscious of the presence of a pedunculated growth in the throat, which gave rise to dysphagia and at times slight dyspœna. It was freely movable, and could be brought up on to the tongue or swallowed at will. Attacks of suffocation coming on caused her to seek surgical advice, when the growth was discovered about an inch and a half long and little over half an inch in diameter, attached by a pedicle about half an inch in length to the lower part of

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[1] Lancet, London, 1858, vol. i., p. 137.

[2] Gaz. des Hôp., 1863, p. 182. [3] Soc. anatomique, 1872.

[4] Bull. et Mém. de la Soc. de Chir. de Paris, 1885, vol. xi., p. 927.

[5] Lyon Médicale, 1888, vol. lix., p. 326.

[6] Annal. des Mal. de l'Oreille, 1888, vol. xiv., p. 541.

the left tonsil. It was removed by the scissors and found to be composed of fibrous tissue. There was no recurrence.

CASE VIII. Reported by Delavan:[1] This was a case in which a small fibroid was discovered accidentally springing from the left tonsil of a man aged 23. It was small in size and pedunculated, and had given rise to no symptoms whatever. It was removed by the écraseur.

CASE IX. Reported by Lublinski:[2] This was the case of a male 35 years of age, with a specific history, in whose throat an examination revealed a small fibroma attached to the lower segment of the left tonsil. The tumor had never given rise to any symptoms and its discovery was accidental. A microscopical examination after removal showed it to be a fibroma.

The above cases were all instances of pure fibroma. Several other cases have been reported in which we find other elements commingled with the fibrous tissues.

FIBRO-CHONDROMA.—The only instance of this form of growth which I find is that reported by Bottini:[3] A female aged 33 had been conscious for three years of the existence of a tumor in the fauces, which had given rise to impairment of the hearing and latterly interference with the respiration. The tumor on examination was found to spring from the right tonsil by a somewhat broad base and to fill four-fifths of the faucial isthmus, displacing the uvula and soft palate. Free access to the growth was obtained by an incision in the soft palate, and the mass was removed by means of the finger. No hemorrhage ensued. An examination showed the mass to be composed of fibro-cartilaginous tissue.

FIBRO-LIPOMA.—Larondelle[4] reports the only instance of this growth, as met with in the tonsil, that I have been able to find: This was an instance in which a tumor developed on the left tonsil of a young woman aged 28, which at the end of six months had attained a diameter of about an inch. It was pedunculated in form and gave rise to a difficulty in deglutition and some dyspnœa. It was easily removed and found to be composed of fatty and fibrous tissue.

FIBRO-LYMPHADENOMA.—Gorecki[5] reports under this name the history of a case of tonsillar neoplasm, careful noting of which leaves one in doubt as to its true nature. It has been considered a sarcoma by many writers, but is reported here, and is again referred to under Sarcoma of the Tonsil. This was an instance in which a small tumor arose not only from the tonsil but the postero-lateral wall of the pharynx, and gave rise not only to local symptoms with reference to deglutition, but was also accompanied by enlargement of the cervical glands. It was removed by the Paquelin cautery, and was found to be composed of fibrous tissue with an admixture of lymphatic and gland tissue.

We thus find that the consideration of neoplastic development in the tonsils has mainly to do with fibrous tumors, and that their principal interest lies in the recognition of their clinical significance, in that very rarely have they given rise to any dangerous symptoms, and in no instance has a fatal issue even threatened;

[1] N. Y. Med. Record, 1882, vol. xxi., p. 296.
[2] Monatschrift für Ohrenheilk., 1887, vol. xxi., p. 277.
[3] Gazetta degli Ospitali, 1885, No. 13.
[4] Bull. de l'Acad. roy. de Méd. de Belg., Brux., 1870, 3d s., vol. iv., pp. 183, 189.
[5] Praticien, Paris, 1878–79, vol. i., p. 177.

unless perhaps we except Leffert's case, in which the tumor attained to such a size as to render the patient's condition somewhat critical on account of the danger of suffocation.

They develop quite insidiously and as a rule grow very slowly. Thus, in Lannois' case, at the end of six years the tumor had only attained the length of an inch. The unusually rapid development observed in Curling's case is quite exceptional, where at the end of one year the tumor is reported to have nearly filled the oral cavity.

The presence of the growth in the tonsil seems to give rise to no symptoms whatever, and it is only when it has attained such proportions as to interfere with the functions of the fauces that the patient usually becomes conscious of its existence. In the cases reported above, it will be noticed that in many instances where the growth was small it had entirely escaped the patient's observation. The first effect of its presence seems to be in its interference with the free movements of the muscles of the fauces in deglutition, and latterly it opposes itself as a mechanical obstacle to the passage of the food. Where it is pedunculated and freely removable, the growth may fall down over the entrance to the larynx and interfere with the respiratory movements, although no instance is reported in which the dyspnœa has been of a serious nature, although in Leffert's, Curling's, and Bottini's cases, the growth interfered with the passage of air through the fauces, the neoplasms being rather of a sessile character.

The recognition of the growth should be comparatively easy, as there are few tumors that present so characteristic an appearance, in their pinkish-white tinge, somewhat nodulated or rounded outline, and their dense resisting feeling to the touch. Furthermore, we may bear in mind that practically the only benign tumor that is met with in the tonsil is usually composed of fibrous tissue, while in rare instances we meet with the admixture of fatty, glandular or lymphatic, and cartilaginous elements as above noted.

The only question of diagnosis that occurs then, is as between the benign and malignant growths—a problem which should rarely present any difficulties.

The proper method of treatment of these growths is very clearly indicated in the brief *résumé* of cases recorded above. They should be removed by the scissors or the écraseur, according as they are pedunculated or sessile. I think, at the present day, when we have become so thoroughly familiar with the great advantages of the cold wire-snare écraseur, that instances will present very rarely which will not be best managed by this device as furnishing an easy method of treatment and one which avoids any danger of

troublesome hemorrhage; although it may be stated that no instance as yet has occurred in which troublesome bleeding in any way complicated the operation for the removal of these growths by other methods.

In Curling's case it will be noted that wider access to the tumor was obtained by enlarging the oral orifice by an incision through the cheek; while Bottini made an incision through the soft palate, in order to more easily reach the tumor. The necessity for any such measures as these, I take it, will very rarely present, especially if we resort to the use of the snare, in that the stiff wire loop of this instrument is easily manipulated, and can be carried with great facility over a tumor and adjusted about its attachments with sufficient accuracy to render the operation comparatively simple, even in cases where the tumor has attained a large size. In Curling's case the tumor had formed adhesions to the palate. Of course in an event of this sort such attachments can easily be broken up by the insertion of the finger or any convenient blunt instrument.

Tumors of the Oro-Pharynx.

The oro-pharynx seems to afford an unfavorable site for the development of benign neoplasms: medical literature furnishes us with but few examples of growths in this locality. Such instances as have been met with are given below.

Dermoid Tumors.—Case I. Reported by Schuhardt:[1] This was observed in a child aged five months, in whom a tumor attached to the post-pharyngeal wall had existed since birth, giving rise to attacks of dyspnœa and dysphagia. It was a pedunculated growth, and was successfully removed by the scissors. It was covered with hairy skin containing sebaceous and sweat glands.

Case II. Reported by Abraham and Barton:[2] This was the case of a female aged 22, in whom a fusiform growth attached to the lateral wall of the pharynx had existed since birth. It gave rise to some dysphagia, with a sense of fulness in the ear. It was removed by the surgeon, mainly with the hope of relieving the severe attacks of migraine from which the patient suffered. It was the ordinary form of dermoid tumor.

Fibroma.—Case I. Deazeley[3] reports having removed a small fibrous tumor the size of a strawberry from the pharynx of a woman who complained merely of some vague faucial symptoms and pain in the head. There was no recurrence in six months.

Case II. Little[4] removed a fibrous tumor measuring two inches by an

[1] Centralblatt für Chir., 1884, p. 673.

[2] Journal of Anatomy and Physiology, 1880, vol. xv. Medical Press and Circular, 1881, vol. xxxi., p. 10.

[3] Lond. Med. Gaz., 1843, vol. xxxii., p. 868.

[4] Med. Times and Gaz., Lond., 1863, n. s., vol. i., p. 507.

inch and a quarter from the pharynx of a man aged 83, who attributed the neoplasm to the excessive use of his voice. There was no recurrence.

CASE III. A curious case is reported by Hartley [1] of a child 2 years old, who was brought to him with a history of a tumor of the fauces commencing at the age of three months, which at the time of presentation had developed to such an extent as to completely fill the oro-pharynx, extending from the laryngeal opening to some distance behind the palate, also projecting forward into the mouth. It gave rise to dyspnœa and general emaciation from lack of nutrition. Tracheomoty was done to relieve the breathing, and pieces of the growth were torn off occasionally, thus prolonging the child's life eight and a half months, making the total duration of the tumor two years and a half. At the time of death the growth completely filled the mouth and naso-pharynx, although no external deformity is reported.

Case IV. Langenbeck [2] reports the case of a large fibroid of the pharynx in a male aged 47, which at the end of six months encroached largely on the oro-pharynx, causing dysphagia and dyspnœa. Middledorf attempted to remove this by the galvano-cautery, and apparently failed to entirely extirpate the growth, in that the dyspnœa continued. About three years later it came under Langenbeck's care, at which time it had assumed large proportions, presenting an external tumor extending from the hyoid bone to the cricoid cartilage, and as far forward as the sterno-mastoid muscle. Langenbeck performed subhyoid-pharyngotomy, and extirpated the tumor, but the patient died three days later of suffocation from some unexpected cause.

Case V. Voltolini [3] reports having removed a small fibroid the size of a pigeon's egg from the pharynx of a patient.

CASE VI. Vibert [4] removed a similar growth by means of the snare from a man aged sixty-three. It had been present for three years, and was notable from having been pedunculated, and, furthermore, the centre of the tumor was ossified.

CASE VII. In a case reported by Cabot [5] a fibrous tumor in a female aged 50, had at the end of a year attained the size of a small egg, giving rise to notable dysphagia. Preliminary tracheotomy was done and the tumor successfully enucleated.

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[1] Med. Times and Gaz., Lond., 1863, vol. i., p. 640.

[2] Cited by Iversen: Arch. für klin. Chir., vol. xxxi., p. 620.

[3] "Die Anwendung der Galvanocaustik," 2d edition, Wien, 1872, p. 226.

[4] Bull. de la Soc. de Chir. de Paris, n. s., vol. v., p. 615.

[5] Archives of Laryngology, vol. i., p. 52.

CHAPTER XXIII.

SARCOMA OF THE FAUCES.

OUR consideration of this affection will be based on an analysis of such cases as have been reported in medical literature, dividing the subject, as before, into: *First*, Sarcoma of the soft palate and pillars of the fauces; *second*, Sarcoma of the tonsils; and *third*, Sarcoma of the pharynx.

SARCOMA OF THE SOFT PALATE AND PILLARS OF THE FAUCES.

CASE I. Bryant[1] reports a case of this disease occurring in a male aged 34, who for two months had suffered from a growth on the soft palate of a somewhat villous character. The tumor was excised and nitric acid applied to the base, in spite of which the growth returned, the cervical glands became enlarged, and the patient succumbed one year after the first appearance of the neoplasm. From the microscopical examination, which is reported somewhat in detail, it was evidently a sarcoma.

CASE II. Veturini[2] reports the case of a boy aged 12, in whom a large, rounded, pedunculated tumor the size of an apple had developed in the right posterior pillar of the fauces, giving rise to dysphagia with suffocative attacks. It was successfully removed by the snare, and found to be of a sarcomatous character. An examination three months later showed no evidence of recurrence.

CASE III. Reported by Stroppa:[3] This was the case of a female aged 28, who had suffered with repeated attacks of tonsillitis. According to her statement, for three years there had been an indolent tumor on the anterior surface of the velum. Of late, however, the growth had increased in size rapidly, and had given rise to symptoms of obstruction in the fauces. An examination revealed a tumor about the size of a pigeon's egg situated near the centre of the anterior face of the velum, the surface of which was slightly ulcerated. The growth was removed through the mouth by means of the knife, and over a year and a half later there had been no recurrence. From the microscopic examination it was apparently a sarcoma, and is so reported.

CASE IV. Bryant[4] reports a case occurring in a patient aged 38, in whom a tumor of the palate had existed for eight years, giving rise latterly to great dyspnœa. Trendelenberg's canula was inserted and the tumor removed through the natural passages. It is reported to have been fibroplastic in character. Considering the date of the report, we are warranted in regarding it as sarcoma, although the eight years' history is somewhat against this view.

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[1] Guy's Hospital Reports, 1861, 3d series, vol. vii., p. 23.

[2] L'Ippocratico, 1871, vol. xix., 3d ser., p. 39.

[3] Giornale di Anatomia e Fisiologia patologica, 1864–65, vol. i., p. 208.

[4] Trans. Path. Soc. London, 1872–74, vol. i., p. 2.

CASE V. Landmann[1] reports having made a post-mortem examination on a man aged 66, whose death was the result of suffocation. He found a large rounded tumor of the soft palate, which on examination proved to be a cylindriform sarcoma.

CASE VI. Albert[2] reports the case of a male aged 62, in whom a tumor on the left side of the soft palate had been present for six months, giving rise to pain and dysphagia. The surface of the neoplasm was ulcerated, aud the cervical glands on each side of the neck involved. The cervical glands were extirpated, and the growth successfully removed through the natural passages and found to be a spindle-celled sarcoma.

CASE VII. Foulis[3] reports the case of a male aged 30, in whom a tumor of the right side of the palate the size of a hen's egg had developed in the course of two years. The glands of the neck were not involved. Lateral pharyngotomy was done and the growth dissected out. There was no recurrence eight months later. The growth was a round-celled sarcoma.

CASE VIII. Macleod[4] reports the case of a female aged 53, in whom a tumor on the left side of the soft palate had existed for two years. Preliminary tracheotomy was done and access to the growth obtained by splitting the jaw. The tumor was successfully enucleated, but the patient died two days later from exhaustion. An examination showed it to be a round-celled sarcoma.

CASE IX. Ott[5] reports two cases of sarcoma of the palate, the first occurring in a male aged 48, who was suffering from advanced pulmonary phthisis. The tumor was discovered accidentally while the physician was making a laryngoscopic examination. It had never given rise to any symptoms, and the patient was not aware of its presence. It was situated on the right side of the soft palate upon its anterior surface, and was about the size of a filbert. There were no enlarged glands.

During the last few months of the patient's life the tumor grew quite rapidly and interfered somewhat with deglutition. The general condition of the patient, however, precluded any operative interference, and death took place from the pulmonary disease.

A microscopic examination of the tumor showed it to be an adenoid sarcoma, a growth of mild malignancy.

CASE X. Ott's second case was that of a male aged 44, who presented with a tumor the size of a hen's egg on the inferior surface of the soft palate. The growth had been present for about six months, during which time it had increased from the size of a filbert to its present dimensions. It had never caused any pain, but for the last few months deglutition had been difficult and the voice had been altered. The left retro-maxillary and parotid glands were enlarged.

The growth in the palate was removed through the mouth, and the patient discharged. About a month after the operation it recurred, and three months after its removal it had attained such dimensions as to render operative interference out of the question. It was an embryonic sarcoma.

CASE XI. Stimson[6] reports the case of a boy aged 10, in whom a tumor attached to the left posterior pillar of the fauces had at the end of eight months

[1] Arch. für Heilk., 1877, vol. xviii., p. 192.

[2] Wien. med. Presse, 1877, vol. xviii., p. 230.

[3] Brit. Med. Jour., 1878, vol. ii., p. 555.

[4] Glasgow Med. Jour., 1880, vol. xiii., p. 240.

[5] Thèse de Paris, 1880, No. 26, pp. 31 and 33. (Cases reported by Tedenat.)

[6] "Illus. Med. and Surg.," 1882, vols. i. and ii., p. 85.

attained such size as to almost completely fill the fauces, interfering with deglutition and producing dyspnœa to such an extent as to have demanded tracheotomy two months previously. There was also a large tumor in the cervical region, which, however, was not continuous with the faucial growth. The cheek was split, and the faucial tumor excised by the écraseur and scissors and crushing with the finger. The cervical tumor was dissected out at the same time. Recurrence took place at the end of a month, and the tumor grew so rapidly, that at the end of five months it was nearly half the size of the patient's head. The tracheotomy tube was reinserted three months after the operation, and death from exhaustion occurred two months later. The growth was a round-celled sarcoma.

Case XII. Eliot[1] reports the case of a female aged 23, who presented with a tumor the size of a walnut in the left side of the soft palate, which had been growing for a year. The glands of the neck were enlarged, and the patient somewhat emaciated. The tumor being considered malignant, no operation was done at this time. About fifteen months later this patient returned, anxious for relief, the tumor having greatly increased in size, interfering with respiration and deglutition. Curiously enough, during the interval, ulcerations which had previously existed on the surface of the growth had cicatrized, while the lymphatics of the neck had increased in size. Her general health had also notably improved. The removal of the growth was done without an anæsthetic, the patient being pinioned in a chair in an upright position. An incision was made in the long diameter of the tumor, and its contents rapidly enucleated, when it was found to be a spindle-celled sarcoma. The parts healed kindly and the patient was apparently cured. She returned, however, three months later on account of a small swelling at the side of the cicatrix. It was intended to remove this on the following day, when a sudden hemorrhage took place without premonition and death followed immediately. No autopsy was made.

Case XIII. Peters[2] reports a case, observed by Dr. Asch, that of a female aged 50, in whom a large rounded tumor had developed on the right side of the soft palate, and had attained such size as almost completely to fill the faucial arch. Its duration was probably about two years. The soft palate was slit and the growth successfully enucleated and found to be myxo-sarcoma. The report was made four years after the operation, at which time the patient had not presented herself: the inference, therefore, was that there had been no recurrence.

Case XIV. Heath[3] reports having observed a tumor in a child aged 7, the gross appearance of which led him to suppose it to be benign in character. On cutting into it, however, its malignancy was apparent, and further operation was abandoned. The patient succumbed five months later from the rapid enlargement of the growth, which was considered sarcomatous.

Case XV. Treves[4] reports the case of a man aged 68, in whom at the end of eight months a tumor of the left side of the soft palate had attained to about two-thirds of an inch in diameter. For three months there had been ulceration on its surface. The carotid was ligated, and the growth successfully excised and found to be an alveolar sarcoma. This patient reported that thirty-seven years previously a tumor had been removed from the same location.

[1] "Illus. Med. and Surg.," 1882, vols. i. and ii., p. 107.

[2] N. Y. Med. Record, vol. xviii., p. 567.

[3] "Injuries and Diseases of the Jaws," Lond., 1884, p. 253.

[4] Trans. Path. Soc. London, 1884–85, vol. xxxvi., p. 397.

CASE XVI. Lussaud[1] reports the case of a male aged 44, who presented with a tumor on the inferior surface of the soft palate the size of a hen's egg. The growth had existed for about six months, and had grown rather rapidly, with the usual effect upon speech and deglutition. The retro-maxillary and parotid glands on the left side were somewhat enlarged. It was removed by means of the knife, but recurred in about a month, and the glandular enlargement had very much increased—so much so as to preclude all possibility of further operation. The result is not given, although we are left to suppose that the disease terminated fatally. It was shown to be a sarcoma by microscopical examination.

CASE XVII. Lussaud[2] reports a second case in a male aged 29, with a history of frequent attacks of angina, apparently rheumatic in character, and also with a history of syphilitic infection. For the past three months the patient had had difficulty in swallowing, which was found to be due to a soft, fluctuating tumor attached to the posterior surface of the soft palate, extending upward as far as the posterior nares, and downward to the base of the tongue. The patient also exhibited marked evidences of cachexia, although a thorough physical examination failed to reveal the involvement of any of the viscera. After the patient had been put upon iodide of potassium, with no apparent benefit, the growth was extirpated as thoroughly as possible, although much of the surrounding tissues, such as the right tonsil, the anterior and posterior pillars, and the right wall of the nasal fossa, were notably involved. In less than a month, however, there was recurrence, and two months after the operation the patient died of exhaustion, having had several attacks of rather severe hemorrhage. A microscopical examination showed it to be a sarcoma.

CASE XVIII. Lussaud[3] reports a third case, in which a tumor the size of a hen's egg was situated on the inferior surface of the right side of the palate. There was no glandular engorgement, and the growth was believed to be an adenoma, and was extirpated. Microscopical examination, however, showed it to be a small-celled sarcoma, and scarcely three weeks after cicatrization a recurrence took place, which involved the greater part of the palate.

CASE XIX. S. Paget[4] reports the case of a male aged 60, in whom at the end of two years a growth on the right side of the palate had attained the size of one and a half inches in diameter. It was successfully removed through the mouth, and found to be a mixed-cell sarcoma.

CASE XX. Gussenbauer[5] reports the case of a male aged 61, in whom a melanotic sarcoma involving the soft palate, and subsequently the hard palate, was operated upon by the galvano-cautery and raspatory, followed by a recurrence four years later, which now involved the velum, both tonsils, the pillars of the fauces, and a portion of the lateral wall of the pharynx.

The above completes the list of cases of sarcoma originating in the tissues of the soft palate, although in this connection mention should be made of the case of adenoma of the palate reported by Deprès,[6] in which a microscopic examination made by Coyne[7] revealed the presence of sarcomatous tissue.

ETIOLOGY.—We thus find recorded in literature twenty cases

[1] Thèse de Bordeaux, Roquefort, 1884, No. 31, pp. 17, 18, and 19.
[2] Ibid.
[3] Ibid.
[4] St. Barth. Hosp. Reports, 1886, p. 347.
[5] Prag. med. Woch., 1886, No. 9.
[6] Bull. de la Soc. de Chir., 1874, p. 371.
[7] Gaz. méd. de Paris, 1874, p. 386.

of sarcoma whose origin was in the structures of the soft palate. Of these, thirteen occurred in males, while but four were in females, following the usual history of malignant disease in the fauces. In three cases the sex is not given.

We should naturally suppose that sarcoma of the palate would be somewhat closely allied to that of the pharynx in its clinical history, and yet, curiously enough, we find that, whereas in the latter case the disease belongs more particularly to the middle period of life, in the one under consideration it seems to skip this period and to occur either early or late in life. Thus, of the cases above given, seven occurred beyond fifty, while nine were met with earlier than the forties. When compared, however, with the tonsil, we find that sarcoma in this region seems to be common to every period of life, though with something of preponderance in the later years.

PATHOLOGY.—Of the cases reported, four were round-celled, two spindle-celled, two myxo-sarcomas, and one each of cylindroma, alveolar, and adeno-sarcoma, while one case was mixed-cell. Gussenbauer's is reported as melanotic, while Bryant's is stated to have been fibro-plastic, in character. In six cases the character of the growth is not given.

Sarcoma of this region seems to carry out, in a notable degree, Butlin's[1] teaching that this disease tends to localize itself, for we find that the lymphatics were involved in but six of the cases—Albert's, MacLeod's, Elliot's, Gussenbauer's, one of Ott's, and one of Lussaud's. That this was a serious complication is shown by the fact that there was recurrence in the last four cases, although the first is reported as having been cured, while in MacLeod's case death resulted from exhaustion. In Stimson's case there were two very large lobulated tumors of the cervical region, which were probably due primarily to lymphatic infiltration. This case, however, was one in which the malignancy of the disease was very striking, much more so than we usually meet with in connection with pure sarcoma in any region of the body.

The development of a sarcoma in the palate seems to be somewhat insidious, and its extension slow. It usually has its origin on one or the other side of the palate, and extends to the opposite side or to the pillars of the fauces. The tendency to extension, however, is somewhat limited, and in a majority of instances the neighboring tissues were not invaded. In Albert's case there was a slight extension to the bony palate. This, however, is rare, and the rule is rather the reverse, as quite a number of cases of sarcoma of the hard palate, in which the soft palate was subsequently in-

[1] "Malignant Disease of the Larynx," London, 1883, p. 14.

volved, have been reported in literature. These cases, however, are omitted in this connection. As regards any tendency to further generalization than involvement of the lymphatic glands, there seems to be no evidence of any such tendency as shown in any of the reported cases.

When we consider the soft, fleshy character of the tumor and its location in a region so notably subjected to functional movements, we should naturally suppose that ulceration of the surface would be a frequent symptom. This has been observed in a number of the reported cases, although it is by no means a constant feature.

SYMPTOMATOLOGY.—As before suggested, the development of hese tumors is somewhat insidious; hence they give rise to not notable symptoms until they have attained such proportions as lead to notable interferences with the functions of the part. These consist, practically, in a modification of the voice and a hampering of the act of deglutition. Where the growth is of such a character as to overhang the larynx, dyspnœa may be produced; or if the tumor is movable it may lead to attacks of suffocation, especially when the patient is in a recumbent position. The secretion from the parts is naturally increased, and in Elliot's case salivation became a source of no little discomfort to the patient. The secretion is usually of normal mucus, although where the surface is ulcerated the discharge may be sero-purulent in character and attended with an offensive odor. In no case, as far as I know, has hemorrhage been a serious complication during the course of the disease, although slight hemorrhage is reported in several cases. The sudden death from hemorrhage in Elliot's case is an unique occurrence. In Albert's case pain seems to have been of a notably distressing character, although ordinarily that has not been present. The general health in no instance seems to have been impaired, other than so far as the nutrition was interfered with by the mechanical interference with deglutition. In other words, sarcoma of the palate gives rise to no special cachexia.

DIAGNOSIS.—The characteristic reddish-pink color and fleshy appearance of the tumor in this region, together with its rounded contour, would naturally suggest either an adenoma, sarcoma, or fibroma. The latter form of tumor is very rarely met with in this situation, and when present is much harder in consistency, less movable, and of slower growth than a sarcoma. The differential diagnosis between adenoma and sarcoma, as based on physical examination, is one of exceeding great difficulty. Heath[1] reports two cases, one of sarcoma and one of adenoma of the palate, both of

[1] "Injuries and Diseases of the Jaws," London, 1884, p. 253.

which he considered benign until after the operation. In discussing them he says, "Looking back at these two cases, I find it impossible to give any symptom by which they might have been distinguished." In most cases we should be notably aided by the clinical history of the case and the rapidity of development, an adenoma developing much more slowly than a sarcoma. Furthermore, the occurrence of ulceration in sarcoma and glandular enlargement, if such be present, throws a certain light on the diagnosis, and yet it should be remembered that ulceration may occur in an adenoma of this region, as shown in a case reported by Hutchinson.[1]

PROGNOSIS.—All the cases reported were operated upon, with the exception of Landmann's and Heath's. In neither of these cases, however, does the report show the total duration of the disease; hence it is difficult to form any estimate as to how long a patient with sarcoma of the palate will live without operative interference. In general, however, I think the teaching is quite clear that sarcoma in this region is not an especially malignant disease, as shown by the fact of successful operations, even after the disease has existed for a long time. Thus, in Asch's case the tumor was extirpated two years after its first appearance, and there was no recurrence three years later, while in Foulis' case also the operation was two years after the onset of the disease, and there was no recurrence at the end of eight months, this latter case being a round-celled sarcoma, Asch's being myxo-sarcoma. Paget's was an equally favorable case of a mixed-cell growth, while MacLeod's seemed to present favorable indications for surgical interference two years after the commencement of the disease, although the patient succumbed subsequently from exhaustion, the growth being round-celled. Of the remaining cases, in Stimson's and Elliot's there was recurrence and death, while Albert's, Treves', and Veturini's were cured. In Gussenbauer's, recurrence did not occur for four years, when a second operation was done, the result of which is not given. In Bryant's, also, the final report is wanting.

We thus find that of our twenty cases there was death without operation in three, death following operation in seven, in eight cases the operation seems to have been successful, while in two the ultimate history is not given, although it is probable that both these cases succumbed later to the disease. This is a percentage which, considering the ordinary malignancy of sarcoma, is to be considered as strikingly favorable, nearly one-half the cases being cured. This percentage might perhaps have been still better

[1] Trans. Path. Soc. of London, 1886, vol. xxxvii., p. 490.

when we consider that Landmann's case of cylindroma died from suffocation, and was only discovered post mortem, in that this form of disease is usually regarded as one presenting favorable opportunities for successful extirpation. It is interesting to note here that of the four round-celled sarcomas, two were cured, while the other cases which were cured were respectively alveolar, spindle-celled, myxo, and mixed-celled sarcomas.

It is certainly worthy of suggestion here that this favorable percentage of cures is probably to be accounted for by the fact of the scanty distribution of the lymphatic vessels in the soft palate, a view which seems to be notably substantiated by the clinical fact that these sarcomas of the palate show a marked hesitancy to extend to neighboring tissues.

TREATMENT.—There is very little of suggestion to be made as regards the method of operating on these cases, based on the results of the reports. Foulis performed a lateral pharyngotomy, the object apparently being to overcome the serious complication of hemorrhage in the fauces, in that the growth is reported as having been the size of an egg, and probably could have been reached through the mouth. This danger of hemorrhage seems also to have been feared by Albert and Treves, the latter of whom ligated the carotid artery before operating, while the former placed a ligature in position for use in case of necessity. That this is a danger to be considered, however, is hardly made evident by the report of cases. In all the other cases the operations were done through the mouth, the tumor either being enucleated, excised, or snared. No suggestion can be made as regards the special instrument to be used or special method to be pursued in these cases. The indications are to remove not only the whole of the neoplasm in the fauces, but any of the cervical glands which may have become invaded by the morbid process. This is to be accomplished by the rules of ordinary general surgical procedure. In several of these cases the tumor was clearly encapsulated, and when this occurs the operation becomes one of comparative simplicity, consisting in simply slitting the mucous membrane and enucleating the growth.

SARCOMA OF THE TONSIL.

According to Butlin,[1] sarcoma is the most frequent form of malignant disease met with in the tonsil. If, however, the number of cases reported in current literature is any indication of the frequency of the disease, we find that carcinoma is by far the more common form, outnumbering the cases of sarcoma more than twofold.

[1] "Sarcoma and Carcinoma," London, 1882, p. 188.

Without reporting these cases in detail, we content ourselves with simply presenting, very briefly, the prominent features of each. Many of them are imperfectly reported, both as to their progress and course, but more especially as to the ultimate results of treatment, and of such operative procedures as were undertaken for their relief.

Crowley[1] reports an instance of the disease occurring in a male aged 17, in whom there had been present for six weeks a swelling in the left tonsil, giving rise to more or less discomfort, with serious attacks of hemorrhage. It was at first mistaken for a quinsy, but its true nature was soon after recognized. It extended into the soft palate as well as downward over the entrance to the larynx, causing notable dyspnœa, for which tracheotomy was done. There was also considerable enlargement of the cervical glands. These were removed by an external operation, while the sarcomatous tumor in the fauces was destroyed by the cautery. There was recurrence in two weeks, and the patient succumbed at the end of six months after the commencement of the disease. Crowley[2] also reports having observed a second case, in a male aged 50, in which the left tonsil was involved. This also gave rise to hemorrhage and was at first mistaken for a quinsy. The patient subsequently died from inanition, no operation being done.

Cheever[3] reports the case of a male aged 57, in which the left tonsil was involved. The disease had existed for one year, and for the last two months and a half there had been suppuration. Lateral pharyngotomy was done, and the tumor completely extirpated. Recurrence took place in the neck, and not in the fauces, and the patient succumbed.

Conner[4] saw a case in a male aged 45, in which the tumor was encapsulated, and involved the soft palate. The cheek was split and the growth shelled out, followed by recurrence at the end of three months. No further history is given. He also reports[5] having seen another case, in a female aged 26, who succumbed to the disease without operative interference.

A case reported by Richardson[6] was that of a female aged 60, who presented with a two-years history of a tumor in the fauces, which extended to the median line, and gave rise also to an external protuberance, although the cervical glands were not involved. Access to the tumor was gained by an incision in the neck, and the whole growth completely extirpated without cutting through into the fauces.

Clark[7] reports a somewhat curious case in a male aged 46, in which a tumor involving the right tonsil had been present for seven years, and which at the time of examination completely filled the pharyngo-oral space, touching the opposite side. For two years the cervical glands had been enlarged, while a suppurating process in the faucial tumor had been going on. No operation was done other than tracheotomy to give relief to dyspnœa. Post-mortem examination showed it to be a round and spindle celled sarcoma pressing on the epiglottis, and extending from the base of the skull to the hyoid bone.

West[8] reports a case as occurring in a female aged 74. It involved the right

[1] Transactions Academy of Medicine of Ireland, 1887, vol. v., p. 161.
[2] Loc. cit. [3] Trans. Amer. Surg. Ass'n, 1886, vol. vii., p. 57.
[4] Trans. Amer. Surg. Ass'n, 1886, vol. vii., p. 61. [5] Loc. cit.
[6] Boston Med. and Surg. Journal, 1888, vol. cxviii., p. 197.
[7] Glasgow Med. Journal, 1886, vol. xxv., pp. 139 and 146.
[8] Trans. of the Path. Soc. of London, 1882, vol. xxxiii., p. 331.

side, and had been present two months. The patient was much emaciated and the cervical glands enlarged. Death occurred three months later from exhaustion. On post-mortem examination, some sarcomatous glands were found near the spleen, and also a probably similar mass in the heart.

Billroth[1] saw a case in a female aged 17, in whom a tumor of the left tonsil, extending through to the neck, had been present for fifteen months. No operation was undertaken. Death occurred soon after. It is reported as a medullary lympho-sarcoma.

Lagrange[2] reports a case of a male aged 23, in which at the end of three months, as a result of rapid development, the faucial isthmus was almost entirely filled by a growth springing from the tonsil. It extended also to the cervical tissues. There was notable dysphagia and dyspnœa. The faucial growth was evulsed, while the cervical part was excised. They were found to constitute a continuous tumor. Death occurred three months later. Microscopic examination showed it to be a round and spindle celled sarcoma.

Goodhart[3] reports a case of a male aged 18, in whom the right tonsil was the seat of a sarcoma. The cervical glands were enlarged. The patient succumbed at the end of nine weeks, apparently as the result of repeated and violent attacks of hemorrhage.

Lennox Browne[4] reports an interesting case occurring in a male aged 53, in which the right tonsil was involved. Pain was quite a prominent symptom of this case, being almost constant, and extending to the ear. There was nasal stenosis, with fetid discharge, and enlargement of the cervical glands. There were several operations by means of the galvano-cautery, which seemed to give considerable relief, although followed by recurrence. This patient finally succumbed to a sudden attack of hemorrhage two months after he was first seen, and seven months after the commencement of his disease. The growth was a lympho-sarcoma.

Zsigmondy[5] reports the case of a male aged 18, in whom a tumor involving the left tonsil, at the end of six months, attained the size of a hen's egg. It was removed by the galvano-cautery loop, and found to be a round-celled sarcoma. There was some secondary hemorrhage, but at the end of a month the parts had healed. No further report is given.

Czerny[6] reports a case occurring in a male aged 34. The tumor commenced in the left tonsil, and by the end of twelve weeks it had attained considerable size, extending backward into the pharynx. Lateral pharyngotomy was done, involving division of the jaw. There was recurrence in six weeks. A second operation was done, followed by death from secondary hemorrhage. The recurrence took place in the base of the tongue, and the hemorrhage was probably from the lingual artery. The disease was lympho-sarcoma, and invaded the walls of the intestine, peritoneum, and mesenteric glands.

Balding[7] reports the case of a woman aged 53, who presented with the history of a sore throat extending back for a month, which had given rise to a severe attack of hemorrhage. He found the left tonsil to be the seat of a notable tumefaction, while the cervical and submaxillary glands were enlarged, and the jaw was fixed. The hemorrhages were repeated, while the glandular enlarge-

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[1] Arch. für klin. Chir., 1869, vol. x., p. 105. [2] Progrès Méd., 1882, vol. x., p. 53.
[3] Path. Trans. London, 1873, vol. xxiv., p. 90.
[4] "The Throat and its Diseases," 2d ed., London, 1887, p. 243.
[5] "Aerztl. Ber. des k.k. allg. Krankenh. zu Wien" (1877), 1878, p. 151.
[6] "Beiträge zur operativen Chir.," 1878, p. 60. [7] Lancet, 1884, vol. ii., p. 320.

ment also increased, and at the end of two months became the seat of a suppurative process. The faucial growth subsequently increased in size and invaded the epiglottis, and gave rise to notable dyspnœa. No operation was done, the patient falling soon into a state of cachexia, and dying from exhaustion six months after the commencement of the disease. The tumor was a round-celled sarcoma.

Pollard [1] reports a case occurring in a male aged 72, involving the right tonsil. The tumor had existed for six months, and was encapsulated. It was enucleated, after an incision, and found to be a round-celled sarcoma. No further history is given.

Barker [2] saw a case in a female aged 74, in whom a tumor involving the right tonsil had been treated as quinsy. When first seen, the disease had existed three months. It was an encapsulated growth, which was enucleated and found to be lympho-sarcoma. Recurrence took place on the opposite side, and the patient died two months later. Barker also reports having seen another case, in a male aged 70, which was operated upon, and no recurrence was reported. He still further refers to a third case, of which no details are given.

Winiwarter [3] saw a case in a male aged 53, in which the left tonsil was the seat of a sarcomatous tumor. The cervical glands were infiltrated, and the liver also involved. No operation was undertaken, and death occurred two and a half months after the commencement of the disease.

Gray [4] reports an alveolar sarcoma involving the right tonsil of a male aged six years. The growth extended to the gum, soft palate, and finally involved the opposite tonsil. It gave rise to an external tumefaction, and is reported as being the size of the fist. No operation was undertaken in this case, and death occurred seven days from the commencement of the disease. Gray, in his article mentions six cases of sarcoma of the tonsil, to which no reference is given. Some of these I have been able to locate, others I fail to discover.

Butlin [5] reports a case occurring in a male aged 53, involving the right tonsil, in which the disease had existed for three months, giving rise to local symptoms with enlargement of the cervical glands. It was treated by means of the écraseur. There were two recurrences, and finally death nine months after the commencement of the disease.

Perhaps the most remarkable case reported in literature is that observed by Weinlechner,[6] who had under his care a man aged 60, who for four months had suffered from a tumor involving the left tonsil. There was ulceration, with fetid discharge. The glands of the neck were also enlarged. Billroth and Albert both saw the case, and refused to operate. Weinlechner proposed to operate, but the patient declined. He therefore resorted to injections of a solution of iodoform and ether in the proportion of one to ten. After six injections there was very marked improvement, while when sixteen injections had been made into the growth, in the fauces, and fourteen into the cervical tumefaction, the tumor had practically disappeared. There was a return six months later, but at the end of seventeen months the disease had completely disappeared. It should be stated, however, in connection with this case, that after he had been under treatment about six months he commenced

[1] Brit. Med. Jour., 1885, vol. ii., p. 793. Trans. Path. Soc. of London, vol. xxxvii., p. 221.

[2] Brit. Med. Jour., 1885, vol. ii., p. 793. Trans. Path. Soc. of London, vol. xxxvii., p. 218.

[3] Arch. für klin. Chir., 1875, vol. xviii., p. 150.

[4] Am. Jour. of Med. Sciences, 1889, vol. xcvii., p. 154.

[5] "Sarcoma," etc., p. 195, case 4.

[6] Wien. med. Presse, 1882, vol. xxiii., p. 1389.

to suffer with repeated hemorrhages, the fourth of which was of such a character as to necessitate the ligation of the left common carotid, which may have had a notable influence on causing a disappearance of the neoplasm.

Weinlechner [1] reports a case occurring in a male aged 60, in whom a tumor had been present in the right tonsil for a year, which latterly had invaded the anterior pillar of the fauces and the soft palate. The surface of the growth was ulcerated. Access to the parts was obtained by section through the cheek and ramus of the jaw, and the tumor extirpated successfully. Secondary hemorrhage set in on the third day, necessitating ligature of the common carotid. The patient succumbed soon after.

Gorecki [2] also reports a successful case in a male aged 46, who had suffered for three months from a tumor of the right tonsil, which was found to be a lymphadenoma, and was successfully operated upon by the thermo-cautery. At the end of two years there was no recurrence.

Cozzolini [3] reports a case of lympho-sarcoma which was operated upon by the galvano-cautery, with no recurrence at the end of six months.

Genzmer [4] mentions a case operated on by lateral pharyngotomy with section of the jaw, in which at the end of two and three-quarters years there was no recurrence, although no full report of the case has ever been published.

Hueter, [5] in making a report on surgery, refers to a case which was operated upon by himself, by section of the jaw, which died of pneumonia. He also refers to a case which Langenbeck operated upon. Neither of these cases, however, have been fully reported.

White [6] reports a case, occurring in a male aged 55, in whom the right tonsil was involved. An external operation was done, and the patient discharged at the end of three weeks. No further report is given.

MacCoy [7] has seen a case of this disease in a female aged 45, in whom the right tonsil was involved. No operation was attempted, and death occurred ten months after the commencement of the disease.

In a case observed by Milani [8] in a boy aged 17, in whom the left tonsil was the seat of the disease, death occurred from suffocation after the patient had fallen into a cachectic state.

Scheurlen [9] reports a case in which a fibro-sarcoma, springing from the right tonsil, had so far encroached upon the lumen of the fauces as to nearly fill it, while at the same time it pressed upon the epiglottis and obstructed the entrance of air into the larynx, giving rise to dyspnœa. Bergmann operated upon this case, but the result has never been published.

Moxon [10] gives the report of a post-mortem examination of a man aged 61, in whom he found a lympho-sarcoma of the left tonsil. The cervical glands were enlarged. The spleen was also affected.

Clutton [11] reported a case, to the Pathological Society of London, of a lympho-sarcoma involving the right tonsil in a man aged 54. The disease had existed for four months, and the cervical glands were enlarged.

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[1] "Aerztl. Ber. des k. k. allg. Krankenh. zu Wien" (1886), 1888, p. 208.

[2] Le Practicien, 1879, vol. ii., p. 177.

[3] Morgagni, June, 1884.

[4] Berl. klin. Woch., 1879, p. 247.

[5] Jahresb. der gesammt. Med., 1869, vol. ii., p. 435.

[6] Am. Jour. of Med. Sciences, 1890, vol. xcix., p. 414.

[7] Trans. Am. Laryngol. Ass'n, 1888, p. 129.

[8] Gaz. Med. Ital.-Lombard., Milan, 1870, vol. xxx., pp. 17 and 18.

[9] Berliner Dissertation, 1885.

[10] Trans. Path. Soc. of London, vol. xx., p. 369.

[11] Trans. Path. Soc. London, 1884, vol. xxxv., p. 157.

Lange [1] is reported to have operated on a case by lateral pharyngotomy with section of the jaw. The tumor was in the left tonsil, and was scraped out. The growth was a round and spindle celled sarcoma, but the full report has never been given.

Jardon [2] cites three cases of primary lympho-sarcoma of the tonsil, as follows: The first case, operated on by Quintin, was that of a male aged 66. For three or four years he had noticed that the voice was slightly altered, and that there was a difficulty in breathing which he believed was due to asthma. These latter attacks becoming more severe, and deglutition becoming difficult at the same time, he consulted a physician, who on examination found the pharynx filled by a tumor the size of a hen's egg, arising from the left tonsil, and almost completely blocking the opening into the œsophagus and larynx. The supra-clavicular glands on the left side were also enlarged. The growth was removed by the écraseur, and the microscope revealed it to be a sarcoma. About three months after the operation there had been no recurrence, and the glands had not increased in size.

The second case was that of a male aged 60, who presented at the clinic complaining of difficulty in deglutition and in respiration. These symptoms were found to be due to a tumor springing from the left tonsil, and which had increased somewhat rapidly in size in the last nine months. The cervical glands on the left side were remarkably enlarged. During the last eight days a tumor had developed in the left mammary gland. As this was considered a secondary deposit, the case was looked upon as hopeless. No interference was advised, and no further record is given.

The third case was that of a female aged 35, who presented with a tumor springing from the right tonsil, which had given rise to pain on deglutition for about five months, although whether the growth had existed for a longer or a shorter time than this is not known. The lymphatic glands were also much enlarged, and were adherent to the sterno-mastoid muscle and to the deep fascia. A piece of the growth was excised, and the microscope showed it to be a lympho-sarcoma. On account of the extensive lymphatic involvement, no operative interference was advised, but the growth was injected with osmic acid, without improvement. The patient was subsequently lost sight of.

Vandeveer [3] reports having seen a case of sarcoma of the tonsil, without entering into detail.

Schroetter [4] reports four cases of this disease as having occurred in his clinic. The first was that of a male 34 years of age, who when first seen exhibited what was supposed to be an enlarged tonsil on one side. This was extirpated in the ordinary manner. Several months after, the patient returned, the growth having recurred, and there was also an extensive glandular enlargement in the neck. A diagnosis of malignant lymph-adenoma was made. A short time after, the patient died, and the microscopical character of the growth is reported simply as a hyperplasia of glandular tissue. It seems probable, however, that this case was one of sarcoma.

His second case was that of a male aged 29, who had suffered for about six months with gradually increasing difficulty in swallowing. Examination revealed a tumor springing from the right tonsil. The submaxillary glands on

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[1] Medical News, Phila., 1887, vol. l., p. 330.

[2] Inaug. Dissert., Bonn, 1883, p. 23, case 3; p. 26, cases 6 and 7.

[3] Trans. Am. Surg. Ass'n, 1886, vol. vii., p. 61.

[4] Jahresber. der Klinik für Laryngol., Wien, 1871.

both sides were enlarged. Some months later, the patient returned, and the tumor was found to be very much increased in size and all the symptoms aggravated. The diagnosis of medullary lympho-sarcoma was made. There were repeated hemorrhages from the tumor, and death occurred soon after.

The third case was that of a male aged 45, in whom examination revealed a pedunculated tumor attached to the left tonsil. This was removed, and a year after, the growth having recurred, the patient returned. The tumor in the pharynx now almost completely filled the cavity, and in addition to this the lymphatic glands, which had been considerably involved at the time of the removal of the original growth, were now very deeply infiltrated, so much so as to preclude all possibility of operative interference. Considerable improvement followed the injection of Fowler's solution of arsenic. The further history is of the case is not given.

His fourth case is interesting from the fact that both tonsils were invaded by medullary lympho-sarcoma. As the patient refused operative interference, the growth on one side was injected with a solution of the sesqui-chloride of iron, and on the other side with tincture of iodine. There seems to have been some improvement, although the complete history of the case is wanting.

Mikulicz[1] reports a case as occurring in a male aged 28, starting in the right tonsil, and which at the end of three months had extended to the tissues of the neck. Preliminary tracheotomy was done and access to the tumor gained by lateral pharyngotomy. The patient died three months after the operation, and six months from the commencement of the disease. The cause of death is not reported.

Weinlechner[2] reports a case occurring in a female aged 51, involving the left tonsil. The disease had existed for three months. The tumor was extracted through the mouth. The result is not reported.

Eliot[3] reports a rather curious case occurring in a male aged 29. The tumor made its appearance in the right tonsil at the age of 20, when an operation was attempted but abandoned. Eight years later it had increased to such a size as to render an operation imperative. This seems to have been successfully done through the natural passages, and at the end of six months there was no recurrence. Eliot states that the growth was sarcomatous, although no microscopic examination was made.

We thus find reported in current literature forty-five cases in which sarcomatous growths seem to have had their origin in the tissues of the tonsil. Some of these cases have merely been referred to in literature in a vague and indefinite way, others have been fairly well reported, together with the operations undertaken for their removal; but, the patients subsequently disappearing from observation, the ultimate result of operative interference cannot be well determined. In most of them, however, the data are sufficiently full to warrant fairly definite conclusions being drawn.

ETIOLOGY.—Sarcoma is usually regarded as a disease belonging to the earlier periods of life; and yet, curiously enough, when invading the tonsil it seems to belong more particularly to adult life.

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[1] Deut. med. Woch., 1886, vol. xii., p. 157.

[2] "Ber. der k. k. Krankenanstalt Rudolf Stiftung in Wien" (1879), 1880, p. 349.

[3] Amer. Jour. Med. Sciences, 1879, n. s., vol. lxxviii., pp. 124 to 126.

This, I think, is especially remarkable when we consider that the lymphatic tissue which makes up the faucial tonsils is in adult life in a state of almost absolute quiescence, or even atrophy.

If we examine the ages at which these cases occur, we find that one occurred in the first decade of life, five in the second decade, five in the third, three in the fourth, five in the fifth, nine in the sixth, six in the seventh, and three in the eighth decade. In eight cases the age is not given.

We thus find but fourteen cases occurring before the age of forty, and twenty cases occurring later. Why this should be, it is at first sight not easy to explain. It certainly is a very striking fact, to one seeing a large number of cases of disease of the upper air passages, that those lymphatics which go to make up the faucial and pharyngeal tonsils, especially the latter, play an exceedingly important part in morbid processes in the throat. Thus, for instance, the catarrhal diseases of children from five to sixteen years are in the large majority of instances dependent upon hypertrophic changes in the lymphatic structures which go to make up the pharyngeal tonsil, giving rise to adenoid disease. These seem to undergo atrophy at puberty, and the lymphatic tissues remain in a state of quiescence during adult life up to perhaps the age of forty or forty-five, after which the prevailing type of catarrhal disease again invades the naso-pharynx in the form of a naso-pharyngitis, wherein these same lymphatic structures, now in a state of extreme atrophy, exercise a very important influence. In other words, the lymphatic structures in this region from five to fifteen years of age are exceedingly active, from fifteen to forty-five they are quiescent, and after forty-five they take on a renewed activity of the nature of which we seem to be in entire ignorance except so far as we observe the outward manifestation in the symptoms referable to the air tract.

There seems to be, therefore, in these facts something of a suggestion as to the cause of the development of a sarcoma in the tonsil in so large a proportion of cases during the earlier and later decades of life.

We have already seen, in the study of sarcoma of the naso-pharynx,[1] that twelve occurred under the age of forty and but seven later in life. It should be remembered, however, that the naso-pharynx is a well-protected cavity, and the parts are not subject to the irritating influences which attend upon the functional movements that take place in the fauces.

As regards sex, twenty-eight cases occurred in males, nine in females, and in eight the sex is not reported. We usually expect

[1] Vol. i., p. 596.

to find a larger number of cases of malignant disease among males than females, but the preponderance here is perhaps unusual, and is only to be still further accounted for by the fact that the habits of life and the exposures to which men are subjected lead to the development of a diseased condition of the upper air passages, which may possibly exercise a certain predisposing influence in the development of malignant disease.

Butlin,[1] in a discussion before the London Pathological Society, on the presentation of Pollard's case, suggested that sarcoma of the tonsil was probably of more frequent occurrence than was generally supposed, and goes on to argue that there is probably some connection between this and Hodgkin's disease, and that possibly many cases of lympho-sarcoma of the tonsil may be really instances of Hodgkin's disease, in which the primary deposit has occurred in the lymphatics of the tonsil before the deposit has occurred in the cervical or other regions. An examination of the cases reported, however, would scarcely sustain this view, in that of the nineteen reports of the microscopic characters of the growth seven are reported as lympho-sarcoma, five as of the round-celled variety, three mixed round and spindle celled, one spindle-celled alone, two fibro-sarcoma, and one alveolar; in other words, while seven may possibly bear out a suggestion of resemblance to Hodgkin's disease, twelve of these certainly must be regarded as true malignant disease. Futhermore, Hodgkin's disease, as a rule, occurs below the age of thirty-five, while the lympho-sarcomas of the tonsil alluded to above occurred respectively at thirty-four, thirty five, fifty-three, sixty-one, and two at seventy-four years of age.

PATHOLOGY.—A sarcomatous tumor when occurring in the tonsil presents the ordinary characteristics of this variety of neoplasm when met with in any other portion of the body. It belongs essentially to the connective-tissue series of neoplasms; hence, having its origin in this elemental tissue in some portion of the tonsil, it develops ordinarily somewhat rapidly, infiltrating and displacing the normal tissues and extending to the parts beyond. Its progress usually differs from that of carcinoma in that this form of malignant disease extends forward to the base of the tongue and palatine arches, whereas sarcoma shows a tendency either to remain stationary or to extend backward into the oro-pharynx. The only instance, as far as I know, in which it has been known to extend forward into the mouth was that of Gray, in which the gums and palate were involved. In the majority of instances the disease diffuses itself into the surrounding parts, although occasionally we find it encapsulated, as occurred in Pollard's,

[1] Brit. Med. Jour., 1885, vol. ii., p. 793.

Barker's, and Connor's second case. In the latter case the character of the tumor is not reported; the former were respectively round-celled and lympho-sarcoma. It should be borne in mind, however, that even where the neoplasm is invested with a capsule, this does not necessarily define the limits of the tumor, in that the sarcomatous tissue may in any given case be found beyond the capsular limit.

The extension of the neoplasm is not only, as before stated, inward, encroaching upon the pharyngeal cavity, but it also penetrates the tissues of the neck, making its appearance externally, where it may assume considerable proportions. This occurred in the cases reported by Cheever, Richardson, Billroth, Legrange, Czerny, Mikulicz, and Gray, the external tumor being continuous with the faucial neoplasm, and not to be confounded with the secondary enlargement of the lymphatic glands of the neck, which was observed in quite a large proportion of the cases. Richardson and Gorecki both made special note of the absence of any enlarged glands in the neck, while this is particularly noted as being present in eleven of the reported cases. Of the remainder, no data on this point are given, but the proportion is certainly not less than above named, two in eleven, and probably more, for, when we consider the malignancy which the clinical history of these cases indicates, and which is manifested by the extension and dissemination of the neoplasm, we should naturally expect this to be evidenced, in the very large proportion of cases, somewhat early in the history of the disease, by the involvement of the cervical glands. It is a somewhat notable fact, in this connection, that the only two cases in which the glands were not involved were cases in which the neoplasm was successfully removed, in Richardson's there being no return in seven months, while Gorecki's is reported well two years after the operation. In three of the cases reported, there seems to have been a dissemination of the sarcoma, Winiwarter's case showing evidence of the disease in the liver, West's in the heart and abdominal glands, while Moxon's involved the spleen.

If there were any tendency on the part of a sarcoma to become the seat of suppurative or ulcerative action, it would seem that the attrition to which the parts are subjected in the fauces would notably encourage the development of such process. As a matter of fact, however, this seems to be a comparatively rare event, except such erosions as naturally occur on the surface of a tumor when impinging on neighboring parts. In Clark's case, however, the suppurative process in the fauces seems to have been a prominent symptom, while in Balding's this occurred in the cervical tumefaction. In Weinlechner's case the tumor is reported as having been

ulcerated on its surface. This was probably merely the result of erosion, although it is quite possible in a sarcoma that a superficial caries may take place as the result of rapid cell growth.

SYMPTOMATOLOGY.—The development of a sarcoma in the fauces is usually somewhat insidious, and it makes its presence known mainly by its mere mechanical interference with the function of the parts, rather than by any subjective symptoms, painful or otherwise. Occasionally, however, there may be present the symptoms of ordinary sore throat of an acute inflammatory character. Thus, in Crowley's and Barker's cases the symptoms were such as to lead to a diagnosis of quinsy—a mistake, however, which was very soon corrected by the duration of the disease and the development of further symptoms.

Hemorrhage is reported as having been a notable symptom in seven cases, and was undoubtedly an accompaniment of a much larger number to a certain extent. This was present to a somewhat serious extent in Balding's, Clark's, Goodhart's, and in both of Crowley's cases. In Czerny's case death occurred as the result of hemorrhage, probably from the lingual artery, after a second operation, and was probably due to an ulcerative process which eroded the blood-vessel. Death in Browne's case also probably occurred in the same way. In Weinlechner's case the hemorrhage was of such a serious character as to demand ligature of the common carotid artery.

The further symptoms which develop as the growth increases in size are largely mechanical, in that deglutition, and thereby nutrition, is notably interfered with, while in some instances, where the tumor extends back into the pharynx and obstructs the entrance of air to the lungs, dyspnœa becomes a somewhat distressing feature of the disease, so much so as to demand tracheotomy, as in Clark's, Legrange's, and Crowley's first case. The presence of the growth naturally excites an increased secretion from the normal mucous membrane of the fauces, while at the same time the interference with function results in a notable accumulation of mucus in the fauces, which adds much to the discomfort of the patient. In addition to this, the erosions or ulcers on the surface of the tumor naturally give rise to a discharge of somewhat ichorous and oftentimes ill-smelling pus. In Clark's and Cheever's cases an abscess seems to have formed in the deeper portion of the neoplasm, which ruptured spontaneously, thereby evacuating a quantity of pus, with notable relief to symptoms.

When the tumor invades the cervical tissues and appears externally, this occurs comparatively early in the history of the disease, after which the external mass usually develops with quite as

much rapidity, if not greater, than that in the fauces. This is probably owing to the fact that there is less to interfere with or hamper its extension in this region. It presents here a somewhat hard, dense, nodulated cake, as it were, which differs in no essential respect from a similar complication in carcinoma, unless perhaps the nodules are less sharp in their outline, and the tumor does not oppose that peculiar cartilaginous hardness to the touch which is met with in the more malignant form of disease. At best, however, the difference is a somewhat nice one, and not easily detected.

It would seem in some cases that a cancerous cachexia is almost as characteristic of sarcoma as carcinoma, and yet this is not to be accepted, for it must be remembered that a sarcoma in the fauces assumes an exceedingly malignant form, more so perhaps than sarcoma of any other region. Moreover, it gives rise to symptoms which react in a very marked way on the general system, in that nutrition, in all cases, is notably interfered with. Add to this, the fetid discharges, repeated attacks of hemorrhage, and perhaps dyspnœa, and we have, I think, quite sufficient to account for the very marked cachexia which shows itself in these cases, without considering it as due to a specific sarcomatous or carcinomatus dyscrasia. Furthermore, there does not seem to be any evidence that these patients fall into a condition of marked impairment of the general health, except as the result of some one of these serious complications. Fixation of the jaw is a notable characteristic of carcinoma rather than of sarcoma. This symptom, however, was present in Balding's case, and is probably to be accounted for by the neoplasm encroaching upon the temporo-maxillary articulation in such a way as to give rise to either a morbid deposit or an inflammatory process there. In this same case suppuration occurred in the external tumor, in connection with a still further and rather curious complication, viz., a glossitis, affecting first one side of the tongue and then the other, which disappeared, however, spontaneously in a comparatively short time.

Diagnosis.—While the commencement of the tumor is somewhat insidious, it is usually accompanied with a certain amount of injection of the mucous membrane surrounding it, which, as before stated, may lead to the mistaken diagnosis of a quinsy. The absence of fever and notable pain in deglutition, and other symptoms which accompany quinsy, ought soon to eliminate the question of a suppurative inflammatory process. After the existence of a neoplasm has been determined, there is nothing perhaps in the gross appearances of the part, in the early history of the disease, which could enable one to determine with any degree of accuracy the character of the growth one has to deal with. After, however,

it has assumed such proportions as to project notably into the fauces, or at the same time has made its appearance in the cervical region, we find a somewhat hard, nodulated tumor, which, as before stated, opposes to the touch a feeling of hardness which is suggestive of carcinoma, and yet is not the dense, bony induration, with the almost angular outlines, which characterize the more malignant disease. In addition to this, on gross inspection, the mucous membrane which covers the growth is somewhat reddened and injected, while, where the tumor itself projects beyond the pillars of the fauces, it presents an aspect which, I think, is somewhat different from either a fibroid tumor or carcinoma, the two forms of neoplasm with which it is most likely to be confounded. Fibroma is an exceedingly rare disease, which develops insidiously and gives rise to no prominent symptoms practically, either local or general. Moreover, it is of exceedingly slow growth, and ordinarily may persist for years without attention being called to the fauces. Hence, it can easily be eliminated in this consideration.

The main interest in diagnosis, then, is between carcinoma and sarcoma. Of these two, carcinoma has no inflammatory surrounding, is of a whitish-yellow tinge as to gross appearance, shows a notable tendency to ulceration, and, if hemorrhage occur, the bleeding is from an ulcerated or eroded artery. It extends forward into the oral cavity, either to the base of the tongue, the arch of the palate, or the cheek. Sarcoma, on the other hand, is covered by mucous membrane in a state of mild catarrhal inflammation, is of a reddish or purplish color, shows very slight tendency to true ulcerative action, and frequent hemorrhages are liable to occur. The source of the bleeding, moreover, is in a mere erosion on the surface of the tumor, and not in an ulceration, and the distinction should always be made between an erosion and a true ulcerative process. As we have already seen in Czerny's case, however, ulceration may occur in sarcoma, when the disease recurs at the site of an operation. Furthermore, sarcoma grows outward into the neck, no case having been reported, as far as I know, in which there was any tendency to extension forward to the root of the tongue or to the cheek.

Of course, at the present day no one will be content with a diagnosis which is dependent on gross inspection of a neoplasm of this character, when a portion of the growth can be so easily removed for microscopic examination, whereby its character can be determined with absolute certainty.

PROGNOSIS.—It has already been intimated that, largely perhaps as the result of its location, sarcoma in the tonsil is to be regarded as of nearly as great malignancy as carcinoma in this region.

This view is not entirely sustained, perhaps, by an analysis of the cases reported, and yet such analysis goes very far toward establishing the truth of this assertion. In eleven of these cases no operation was done, and the patients succumbed at the end of periods varying from two and a half to fifteen months, with the exception of Clark's case, which survived for seven years. As regards this latter case, it should be stated that a careful reading of the history leaves a very serious question in the mind as to whether the case was one of sarcoma during its whole period or whether during the earlier portion of those seven years the faucial tumor may not have been benign in character. Certainly it is difficult to understand how a mixed-celled sarcoma, such as this is reported to have been, should remain apparently quiescent through so long a period of time. Nine cases are reported as having been operated upon by lateral pharyngotomy, galvano-cautery, écraseur, and other methods, all of which resulted in death in periods varying from two to twelve months from the commencement of the disease. In six cases operations were done in which the disease is reported as having been succesfully extirpated. In Hueter's case the operation seems to have been successful, but the patient died soon after of pneumonia. In Cozzolino's case death occurred seven months later from apoplexy, while Mikulicz's case died three months after the operation, up to which time there apparently had been no recurrence. Zsigmondy's case was operated upon, and no recurrence is reported at the end of one month, while in White's, Pollard's, Jardon's, and Langenbeck's cases we have no record of the ultimate results of the operation. Of the remaining cases the reports are imperfect.

The very great fatality of sarcoma in this region is undoubtedly largely dependent upon the fact that the lymphatic tissue of the tonsil is very intimately and closely connected with the lymphatics of the neck, as the result of which the cervical region becomes involved very early in the history of the disease, and in many cases, as we have seen, the tumor in this region assumes larger proportions than in the fauces. This not only complicates the operative procedure which is resorted to for the extirpation of the growth, but furthermore adds greatly to the difficulties of completely removing every centre of sarcomatous development. In consequence of this latter, of course, recurrence takes place in quite a large number of cases.

We thus find that of the whole forty-five cases, five appear to have been successfully operated upon. If, however, we examine these cases, we shall find it exceedingly difficult to establish any such favorable percentage of success in the treatment of this dis

ease. These cases were those reported by Richardson, Eliot, Gorecki, Genzmer, and Weinlechner.

There is some question as to whether Richardson's case was really a neoplasm of the tonsil, in that it first made its appearance externally, and the operation by means of which it was extirpated did not open into the pharyngeal cavity, the outer wound being separated from this cavity, however, merely by the thickness of the mucous membrane. Furthermore, the ultimate history of this case only extends to seven months after the operation. In Eliot's case the tumor practically filled the oral cavity, and had existed for nine years. It was removed, and no recurrence was reported at the end of six months. The long duration here certainly suggests the possibility of a less malignant form of growth. Gorecki's case was operated on by the thermo-cautery, and there had been no recurrence in two years. Genzmer's case is not reported in full, although it is stated that there was no recurrence at the end of two and three-quarters years. The operation in this case was by section of the jaw. Weinlechner's case is probably the most curious of them all, in that the growth was dissipated by the injection of a solution of iodoform in ether. Chiari made the microscopic examination, and reports it as a spindle-celled sarcoma. It will be remembered that excessive hemorrhage in this case demanded the ligation of the carotid artery. It becomes, therefore, a question of some interest as to how much this operation may have influenced the growth, or whether the favorable result was due to the combined action of the injections.

While, therefore, sarcoma of the tonsil must be regarded as an exceedingly fatal disease, we are certainly warranted in the assertion that in a small proportion of the cases the eradication of the neoplasm may be hoped for. Weinlechner's case certainly would seem to have afforded grounds for quite as unfavorable a prognosis as any reported, Billroth and Albert both regarding an operation as hopeless; and yet this patient recovered. Next in order we should regard Genzmer's case as the most flattering result, had but a full report been given. In Gorecki's case the neoplasm was removed by the thermo-cautery. At the time the operation was regarded as unpromising, in that the tissues beyond seemed to be infiltrated with what appeared to be a sarcomatous deposit. Two years later Gorecki wrote to Butlin[1] that this patient was quite well and free from disease. It seems unfortunate that the full details of the subsequent procedures in so important a case were not reported.

We find it difficult, therefore, to draw definite conlusions from these cases, other than that whereas the disease is exceedingly

[1] "Sarcoma and Carcinoma," p. 193.

fatal, even those cases which present unfavorable symptoms must not always be regarded as absolutely hopeless. Aside from this consideration, I think a fair estimate of the prognosis of sarcoma of the tonsil can easily be arrived at from the brief *résumé* of cases given above.

TREATMENT.—The first and prominent indication seems to be the thorough extirpation of the growth by such means as will accomplish the end with the least degree of injury to surrounding parts; while at the same time any danger of stimulating renewed activity of development in the sarcomatous process should be avoided.

It is scarcely necessary to say that it is a matter of some importance to estimate with definiteness the character of the tumor at the earliest possible period; and furthermore, that as soon as it is ascertained that the growth is sarcoma, the operation should be postponed no longer than is absolutely necessary.

I have no personal experience with this form of neoplasm as affecting the tonsil, but, influenced perhaps by my experience with this disease in other portions of the air tract, I am disposed to be somewhat decided in my opinion that where available the cold wire-snare écraseur should be resorted to. My preference for this is perhaps largely based on the successful issue in the case of sarcoma of the naso-pharynx,[1] and the two cases of sarcoma of the nasal passages, already reported,[2] notably of the former, wherein the ill effect of the galvano-cautery seemed to be very strikingly illustrated, especially where it was used in the lower pharynx and in the region of the tonsil. It might be not improper to recall in this connection that in the case of sarcoma of the naso-pharynx referred to, the tonsil and lower pharynx were subsequently involved.

Weinlechner's success with ligation of the carotid, and iodoform injections, has already been sufficiently alluded to. I am disposed to think, however, in this case that the shutting off the blood supply had far more to do with the dissipation of the tumor than the injections—a point which is fairly well sustained, I think, by Bryant's case of sarcoma of the naso-pharynx.[3]

As regards those cases which involve the cervical tissues, of course the successful extirpation of the neoplasm can only be accomplished by lateral pharyngotomy. It is interesting to note in this connection that in quite a number of cases in which the external operation was done the recurrence made its appearance in the external wound rather than in the fauces.

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[1] Case 19, vol. i., p. 602. [2] Cases 40 and 41, vol. i., pp. 445, 446.
[3] Case 18, vol. i., p. 601.

Sarcoma of the Pharynx.

We have already referred to the point made by Fox that the tonsil, being the meeting-point of the hypoblast and the epiblast in the development of fœtal life, is a favorable site for the occurrence of neoplasms; and furthermore that malignant disease in the tonsil takes the form of carcinoma rather than of sarcoma. Coming now to the pharynx, a region which belongs rather to the hypoblast alone, this tendency to neoplastic growth apparently disappears to a certain extent; and furthermore, as regards malignant disease, there seems to be no very special preference as to the form which this takes; for whereas the pharynx, being composed largely of connective tissue, we should naturally expect to find a notable preponderance of sarcomatous growths, as a matter of clinical observation carcinoma seems to be nearly as frequent, and both forms much less frequent than in the lymphatic tissue of the tonsil.

In examining the literature on the subject we find the following cases reported:

Rosenbach [1] has reported a case occurring in a male aged 45, in whom a tumor attached to the right lateral and posterior walls of the pharynx at the end of ten months had attained sufficient dimensions as to almost completely fill the oro-pharyngeal cavity. The cervical glands were enlarged. It was extracted by means of subhyoid pharyngotomy, and was found to be a round-celled sarcoma. The patient was discharged well.

Ehrendorfer [2] saw a case in a female aged 48, in whom a tumor attached to the posterior wall had at the end of two years attained such size as to cause notable difficulty in respiration and deglutition. The cervical glands were enlarged. The growth was extracted by lateral pharyngotomy, and found to be plexiform sarcoma. There was no recurrence four months later.

Billroth [3] reports the case of a male aged 50, in whom a tumor attached to the right side of the pharynx had existed for six months. It was removed by the écraseur and found to be a fibro-sarcoma. This patient was well six years later.

Arnott [4] reports having observed two cases of this affection. One occurred in a female aged 19, in whom a tumor the size of a green walnut had been present for three months, giving rise to difficulty in deglutition and impairment of voice. It was seized and twisted off. The growth was pedunculated, and appears to have been a spindle-celled sarcoma. There is no further report. His other case was that of a female aged 40, in whom a sessile tumor was observed attached to the left lateral wall of the pharynx. It had been present a year and a half, and had given rise to difficulty in deglutition, with marked dyspnœa. An incision was made into the growth, and it was found to be par-

[1] Berl. klin. Woch., 1875, vol. xii., pp. 519 and 531.
[2] Arch. für klin. Chir., 1881, vol. xxvi., p. 578.
[3] Arch. für klin. Chir., 1869, vol. x., p. 107.
[4] Lond. Med. Gaz., 1845, n. s., vol. i., p. 530.

tially cystic in character. The mass was ligated and subsequently sloughed off. It is reported as a case of albuminoid sarcoma. There was no recurrence at the end of five years.

Wagner[1] reports a case occurring in a male aged 26, in whom a tumor developed in the posterior wall of the pharynx, while nearly at the same time the cervical glands became involved. Both grew somewhat rapidly, and at the end of eight months an operation was done. This was followed soon by a recurrence, and the patient subsequently died.

Peters[2] reports the case of a male aged 40, in whom a tumor attached to the posterior and lateral walls of the pharynx had, at the end of five months, attained such a size as to give rise to notable interference with deglutition, followed by impairment of nutrition. The tumor was extracted through the natural passages by evulsion, after preliminary tracheotomy, and the patient left the hospital well. No further report is given. Peters[3] also reports a case observed by Sands in a male aged 28, in whom a tumor attached to the posterior and lateral walls of the pharynx had existed for eighteen months, giving rise latterly to difficulty in deglutition and attacks of dyspnœa, especially at night. It was enucleated through the natural passages, and found to be an adeno-myxo-sarcoma. This patient was well two years later.

Knight[4] reports a case occurring in a female aged 36, in whom a pedunculated tumor was discovered attached to the lower portion of the pharynx. It had been present probably for two years, giving rise latterly to attacks of dyspnœa, and some difficulty in deglutition. It was only seen by the laryngeal mirror. Preliminary tracheotomy was done, and the growth removed by the galvano-cautery loop. It was about the size of a horse-chestnut, with a pedicle half an inch in diameter. It recurred, and at the end of two years had attained its original size. No further operative interference was undertaken. It was examined by Dr. Fitz and found to be a spindle-celled sarcoma.

Cohen[5] refers to a case of round-celled sarcoma of the pharynx, which had been attending his clinic at Jefferson Medical College for two years. Tracheotomy was done, and large masses removed from time to time by the natural passages, which the reporter seems to think may have prolonged the life of the patient.

Weiss[6] reports the following instance of this affection: The patient was a male, who for four months had had difficulty in respiration. This at the time of admission was so severe as to necessitate immediate tracheotomy. Examination revealed a rather diffuse infiltration of the posterior and lateral pharyngeal wall on the right side, extending as low as the level of the larynx. There was also a very marked infiltration of the cervical glands. The patient died about a month and a half after tracheotomy was performed, and the autopsy revealed the location of the tumor as above described, the lower part, however, being pendulous and almost completely obstructing the larynx, which was not invaded. The growth was a sarcoma.

McLeod[7] reports the case of a round-celled sarcoma occurring in a male aged 33, in whom the tumor had been present six months, giving rise to dysphagia and slight dyspnœa. The tumor was pedunculated, and springing from

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[1] Deutsche Klin., 1861, p. 61.
[2] N. Y. Med. Record, 1880, vol. xviii., p. 565.
[3] Ibid.
[4] Trans. Amer. Laryngol. Ass'n, 1879, p. 204.
[5] "Diseases of the Throat and Nasal Passages," N. Y., 1879, p. 252.
[6] Rev. méd. de l'Est, 1881, vol. xiii., p. 706.
[7] Indian Medical Gazette, 1881, vol. xvi., p. 146.

the posterior wall of the pharynx, had attained the size of an orange, forming attachments with the soft palate. After preliminary tracheotomy, the growth was removed by the écraseur, and the patient discharged, apparently well, six weeks later.

Lodder [1] also reports having operated on a case of fibro-sarcoma attached to the pharyngeal wall, and which had attained the size of a large lemon. It was successfully enucleated, though the later history is not given.

Busch [2] reports a case occurring in a male 34 years of age, in which a tumor attached to the pharyngeal wall had, at the end of six months, attained the size of a goose egg, giving rise to dyspnœa and other symptoms. Access was obtained to the growth by an incision through the palate, after which it was successfully enucleated. The carotid artery was ligated, as a precautionary measure. It is reported as a sarcoma. No further history is given. Busch also reports a second case, that of a male aged 70, in which the tumor at the end of a year attained but small dimensions. He did the same operation, with the exception of the ligation of the carotid, and apparently with the same success. The same observer reports still a third case of tumor of the pharynx which he considered sarcoma, but the growth gave rise to so little annoyance that the patient was unwilling to submit to an operation.

Felici [3] reports a case which was observed in Massei's clinic, in a man aged 53, in which the tumor was situated low down in the pharynx, and had become ulcerated to such an extent as to lead to the suspicion of syphilis, the man giving a specific history. It was operated upon, and found to be a giant-celled sarcoma. The ultimate history of this case is not given.

In addition to the above, a number of cases have been reported as sarcoma of the pharynx which, on investigation, have been found to be either unreliable or to have had their origin in the tonsil or neighboring parts. Max Schaeffer [4] also reports having operated upon four cases of sarcoma springing from the posterior pharyngeal wall, without giving details.

In a study of the above cases, perhaps the most notable teaching is the striking difference between sarcoma of the pharynx and sarcoma of the tonsil; for while we find the latter an exceedingly grave disease, with a fatal termination in the very large proportion of cases, the former disease we find to be, as a rule, quite amenable to treatment. This can only be explained by the fact of the rich lymphatic distribution in the tonsil, and its close and intimate relation with the lymphatics of the neck. This results in a very early involvement of this latter region in the extension of the tumor. In the pharynx, on the other hand, the disease seems to be localized from the onset, thus supporting, in a somewhat striking way, the view expressed by Butlin,[5] who, in discussing the

[1] Weekblad van het Nederlandsch Tijdschrift vor Geneeskunde, 1886, No. 47.

[2] Annalen des Charité-Krankenhaus, 1857, Jahrg. 8, vol. i., p. 89.

[3] Morgagni, 1888, vol. xxx., p. 205.

[4] "Chirurg. Erfahrungen in der Rhinol. und Laryngol.," 1885.

[5] "Malignant Disease of the Larynx," London, 1883, p. 14.

question of sarcoma as involving the larynx, and explaining the fact that in that region it seems so frequently to be merely a local disease, takes the ground that this is owing to the lymphatic glands not becoming involved. He states that "the obstacle to glandular affection in these cases is mechanical, and the glands are not affected, simply because the elements of the tumor cannot obtain access to them." His explanation is that the "sarcomas of these parts arise by the proliferation of the cellular elements of the solider structures of the connective tissues. As the cells proliferate, the solid structures gradually swell, and the lymphatic vessels suffer a diminution of their calibre, which proceeds to their complete obliteration, and renders them incapable of transmitting the infecting material of the tumor."

ETIOLOGY.—We find that sarcoma in this region seems to be a disease of middle age, in that most of the cases occur between thirty-five and fifty. As regards sex, the general rule of malignant disease obtains that about two-thirds are met with in males, the proportion of males being not so great here as we found to be the case in sarcoma of the tonsil. In many instances there have been reported the histories of sore throats and catarrhal disorders. How far these conditions have been active as predisposing causes, of course, is purely problematical. Aside from these considerations, no suggestion can be made as regards the etiology of the disease.

PATHOLOGY.—A sarcomatous neoplasm in this region presents no features which differ in any essential degree from the same tumor as found in other portions of the air-tract. As regards the variety of sarcoma, in many cases this is not specified, while in two it is reported as fibro-sarcoma, two round-celled, and two spindle-celled, while there were one each of plexiform, giant-celled, albuminoid, fibro-myxo-sarcoma, and adeno-myxo-sarcoma.

Allusion has already been made to Butlin's theory of the manner in which a sarcoma may remain an apparently local disease in the larynx. This is strikingly true, as the clinical histories show us, of sarcoma in the pharynx, for, while in a few of the cases above reported the cervical glands were involved, in the majority of them this complication seems not to have been present. Of course, where this existed it must be accepted as a tendency to generalization. As regards any further tendency toward involvement of other organs of the body, I find no record of such, although it will be remembered, with reference to sarcoma of the tonsil, that several instances were given where some of the viscera were invaded.

SYMPTOMATOLOGY.—A sarcoma in the pharynx makes its presence felt, in the early history of the case, merely as a mechanical

obstruction to the ordinary functions of the parts, especially with reference to deglutition. In many cases this is the only symptom which practically presents until the tumor has attained such size as to overhang the larynx and to interfere with the entrance of air. When this latter condition obtains, the dyspnœa is comparatively slight usually during waking hours, but is notably aggravated by the recumbent position. In Knight's case, it will be remembered, the tumor was very peculiarly shaped, being small and pedunculated, hence the attacks of suffocation became very prominent. Secretion from the surface of the tumor itself is usually limited, although the accumulation of an excess of mucus, owing to the immobility of the parts, may become a notable symptom. The secretion is also liable to be stimulated to an extent by the presence of the growth.

In none of the cases was pain, of a neuralgic character or otherwise, in any way a prominent symptom; in fact, these growths develop in a somewhat insidious and painless manner, and their whole clinical history is marked by merely mechanical interference with the function of the fauces. Hemorrhage, so frequently met with in sarcoma of the tonsil, is not usually present, although in Wagner's case the patient suffered from several attacks of somewhat troublesome bleeding. If the growth extend upward into the upper pharynx, or press upon the soft palate, nasal respiration is interfered with, while in all cases the *timbre* of the voice is changed, and phonation is liable to be notably impaired.

In no instance, as far as I know, was cachexia present. In those cases in which the general health has been impaired and a wasting of flesh noted, this has been due mainly to the interference with deglutition and the resultant impairment of nutrition. This will be easily understood when we consider that in many cases the tumor has attained such size as almost to completely fill the pharyngeal cavity, rendering the swallowing of solids impossible.

Ulceration occasionally occurs, although this is a rare complication. When this sets in, of course, the secretion from the part is notably increased, and is usually of a fetid or ichorous character. In Rosenbach's case this process went on to such an extent as to result apparently in a superficial sloughing, with the exfoliation of portions of the growth.

DIAGNOSIS.—The gross appearances of sarcoma of the pharynx seem to be of a rounded, somewhat nodulated tumor, of a dark pinkish or red, verging on a purplish hue, the surface being somewhat mottled in aspect, while coursing through the membrane covering it may be seen, standing out in prominent relief, enlarged and tortuous veins. It is usually pedunculated, and therefore

somewhat movable, and to the touch gives that peculiar sense of hardness and semi-elasticity which is perhaps midway between a fibroma and a myxomatous tumor.

The neoplasms with which it may be confounded are, practically, carcinoma and fibroma, in that other varieties of tumors are met with in exceeding great rarity in this region. From fibroma it should be easily distinguished by its mobility and the dark reddish hue; while with carcinoma we have the usual history of superficial ulceration, the enlargement of the cervical glands, the irregularly nodulated outline, and semi-cartilaginous density to the touch, with immobility. Moreover, carcinoma in this region rarely forms a distinctly projecting tumor of any size, its tendency being rather to infiltrate and burrow into the tissues beyond.

Of course no definite diagnosis would be determined upon in a case of this kind, without resorting to the very simple device of removing a portion of the growth for microscopic examination.

PROGNOSIS.—As before intimated, sarcoma of the pharynx is by no means the very grave disease which we have found it to be where the tonsil is the primary seat of development. If we examine the cases above alluded to, we find that, in quite a large proportion of them, the disease seems to have been entirely eradicated. In Billroth's, Arnott's second, and Sand's cases, the patients were reported well respectively at the end of six, five, and two years; while in Ehrendorfer's case the patient was free from the disease four months after the operation. In McLeod's, Peter's, Lodder's, Arnott's first, and Busch's two cases, the patients were discharged cured; in Felici's case there was recurrence, as also happened in Rosenbach's case, according to the report of Iversen.[1] In Wagner's case death occurred. Knight's case is simply interesting as showing how, even after a recurrence, the disease may become practically stationary; while Cohen's case shows the amount of relief that may be afforded by removing such portions of the tumor as interfere with the function of deglutition.

We find, thus, three absolute cures, seven which we must accept as cures, although perhaps the time which had elapsed after the operation was not sufficient to warrant a belief that there was no recurrence, while but four are reported as having succumbed to the disease absolutely, or, including Cohen's, five cases of death in all. It is interesting to note, in this connection, that in two of the fatal cases, Wagner's and Rosenbach's, the cervical glands are reported as having been enlarged, which, of course, carries with it a suggestion of a certain amount of prognostic value here, although in Ehrendorfer's case, which is reported well four months after

[1] Arch. für klin. Chir., vol. xxxi., p. 610 *et seq.* Case reported by Baum.

the operation, the cervical glands were also enlarged. It is furthermore a noticeable fact that in all six cases where the sarcomas contained a large amount of fibrous tissue, they got well, whereas, of the fatal cases, Rosenbach's and Cohen's were round-celled sarcoma, Felici's giant-celled, while Wagner's is not specified.

TREATMENT.—These growths are easily accessible through the natural passages, and ordinarily require no incisions through healthy parts, although it will be remembered, in connection with Busch's case, that it became necessary to make an incision through the soft palate. At the present day, with our improved methods of manipulation, it is doubtful if such a procedure would become necessary. In a number of instances, where the growth was encapsulated, and it seems to be encapsulated in a large proportion of the cases reported, a linear or crossed incision was made through the investment, and the growth simply enucleated by the index finger.

As has been observed, most of these tumors assume the pedunculated form. In such an instance the most available method of operating, in our day, would consist in placing the loop of the écraseur around the pedicle, and severing its connections. The question arises here, of course, as to the comparative advantages of the cold-wire loop or the galvano-cautery. The clinical history of the cases given would seem to indicate that hemorrhage is not an accident to be anticipated, certainly to any such extent as to be a dangerous complication. The prominent justification for the use of the galvano-cautery écraseur is in the avoidance of hemorrhage. I am disposed to doubt whether this instrument should be given preference, especially when we consider the ease and simplicity of manipulation of the cold-wire snare. Moreover, by the slow manipulation of the steel wire, expending an hour or longer, if necessary, in slowly contracting the loop, the loss of blood can be very materially avoided, and it seems to me that this instrument offers advantages over any other method of operating. Moreover, I think we should always bear in mind the fact that the use of the galvano-cautery is capable of exciting not only inflammatory reaction, but possibly of stimulating a recurrence of the growth.

In many instances a preliminary tracheotomy was done before the removal of the neoplasm. The advisability of this course will be decided in each individual case by the symptoms present, and the character and the size of the tumor. In Busch's case, before the operation, the carotid artery was ligated. This was done because the surgeon detected evidences of dilatation in this artery, and for this reason feared troublesome hemorrhage.

If a case should present which from its special features seemed to demand the gaining access to the pharynx by external incision,

the decision would lie between a lateral pharyngotomy and a subhyoidean pharyngotomy. In Rosenbach's case the latter operation was done, while in Ehrendorfer's case the former procedure was resorted to.

If, after the primary operation for the removal of a tumor, fragments of sarcomatous tissue should be observed at the seat of the wound, the question arises as to the destruction of this by the galvano-cautery or other measures, or its removal. I think there can be no question here as to the advisability of removing it by means of the snare, or such other measure as may be attended with the least danger of inflammatory reaction. Certainly I think that the use of caustics should be resorted to with great hesitation, basing this view largely, perhaps, on my experience with the use of caustics, in other portions of the air-tract, in dealing with sarcomatous disease.

It is scarcely necessary to add, in conclusion, that if any of the cervical glands are involved, it is the duty of the surgeon to remove them at the same time that the faucial tumor is extirpated. It is interesting to note, in this connection, that in Rosenbach's case the cervical glands only became involved after an unsuccessful attempt at removal of the tumor through the natural passages. Some days later the patient was subjected to subhyoidean pharyngotomy.

CHAPTER XXIV.

CARCINOMA OF THE FAUCES.

In the discussion of the more malignant form of faucial neoplasms we follow the same plan as was adopted in the previous chapter, basing our conclusions on a brief *résumé* of such cases of carcinoma in the region as have been reported in medical literature. The subject is subdivided, as before, into: First, carcinoma of the soft palate and faucial pillars; second, carcinoma of the tonsil; and third, carcinoma of the oro-pharynx.

Carcinoma of the Soft Palate.

Case I. Reported by Haas:[1] The patient was a male aged 60. He had complained for a long time of difficulty in respiration and deglutition, with decided alteration in the quality of his voice. Examination revealed the symptoms to be due to a growth, apparently behind the soft palate, pushing this forward. An exploratory incision, however, revealed that the tumor, instead of being behind the palate, really lay in its substance, and consisted of a diffuse carcinomatous infiltration. The growth was removed with the knife as thoroughly as possible, but, notwithstanding this, the patient died nine months later of asphyxia due to a recurrence of the disease. There were also symptoms before death of general carcinomatous invasion, and there was a cancerous deposit of considerable size at the angle of the eye.

Case II. Reported by Heurtaux:[2] This was the case of a male aged 53, a great smoker, who had suffered from a tumor of the soft palate for about eight months, which had been cauterized repeatedly with nitrate of silver, with no result. At the time of operation the growth had invaded also the left faucial pillar. The diseased portion was separated by means of the thermo-cautery and scissors. A microscopic examination proved the growth to be a lobulated epithelioma, probably having its origin in the glands and the soft palate. No further history of the case is given.

Case III. Reported by Michaux:[3] Michaux cites two cases of this disease. The first occurred in a male aged 45, who presented with a history of having a feeling of a foreign body in the pharynx four months previously. Gradually deglutition became affected, and later respiration became difficult. On examination a tumor was found involving the left half of the soft palate, and adhering to the pharynx and posterior nares. A part of the growth was excised through the mouth. Recurrence having taken place in a month, the cheek

[1] Thèse de Strasbourg, 1861 2d series, No. 563, p. 15.

[2] Bull. de la Soc. anat. de Nantes, Séance of February, 1881, Paris, 1882, vol. v., p. 18.

[3] Bull. de l'Acad. méd. roy. de Belgique, 1846–47, vol. vi., p. 114.

was split and the growth removed, together with a portion of the hard palate. Two months later it recurred in such proportions as to preclude all possibility of further operative interference, and the patient died a year after. No microscopic examination was made.

CASE IV. His second case was that of a male aged 44, who for ten years had suffered with difficulty in deglutition and respiration, which on examination was found to be due to a hard tumor involving the left side of the soft palate. It filled the fauces, and extended down as far as the epiglottis. The growth adhered to the lateral and posterior pharyngeal walls, to the sphenoid, the hard palate, and to the inferior maxilla, and was slightly ulcerated. The cervical glands on the left side were also enlarged. The glands were removed, the common carotid tied, and access to the growth was obtained by splitting the cheek. It was removed, and the patient is said to have been discharged cured. No further history is recorded.

CASE V. Reported by Bergh:[1] This case was that of a child aged 4½ years, who suffered from a medullary carcinoma of the soft palate of several months' duration. A portion of the hard palate was also involved. The growth was partially extirpated, but recurred, and increasing in size, involved the entire soft palate and hung downward into the pharynx. There were no enlarged glands. Death occurred in about a year, from interference with respiration and deglutition.

CASE VI. Cited by Friedrich:[2] The patient was a male aged 61, who about four years previously had noticed a tumor on the right side of the velum. This had begun apparently as a small warty growth, and, after remaining about a year, apparently grew smaller. Two years previously, however, the patient began to have pain in this situation, and noticed a small ulcerated patch on the right side of the soft palate, near its junction with the hard palate. On examination, a rough, nodulated tumor was found on the right half of the velum, extending nearly to the median line. The cervical glands were not enlarged. The growth was extirpated, and the patient discharged apparently cured. Microscopical examination showed that it was of a distinctly carcinomatous nature.

CASE VII. Reported by Minich: This was a case of a male aged 57, who for about three months had suffered from a gradually increasing tumor in the fauces, giving rise to difficulty in deglutition. An examination revealed a growth projecting below the margin of the soft palate. It also passed up behind it and was apparently attached to its posterior surface. The tonsil, the corresponding faucial pillar, and the posterior pharyngeal wall seemed to be slightly involved. The diseased tissue was removed through the natural passages as completely as possible by means of the knife. The ultimate result is not given.

CASE VIII. Ott reports a case of epithelioma of the soft palate occurring in the service of Dr. Blum, of Strasburg. The patient was a male aged 21, who presented with an ulcerated tumor occupying the middle and the posterior surface of the soft palate. The tumor was about the diameter of a two-franc piece, and was separated by a well-defined line of demarcation from the surrounding parts. It was excised through the natural passages, and the microscope proved it to be an epithelioma. No further history of the case is given.

CASE IX. Reported by Ferrand: This was the case of a male aged 74,

[1] Arch. für klin. Chir., vol. v., b, p. 190. [2] Inaug. Dissert., Berlin, 1870, p. 35.

[3] Giornale Veneti di Scienze Mediche, 1850, vol. i., p. 93.

[4] Thèse de Paris, 1880, No. 26, p. 49.

[5] Jour. de Méd. de Bordeaux, 1863, 2d ser., vol. viii., p. 74.

who for a year had complained of considerable pain of a lancinating character in the roof of his mouth. An examination at an earlier period had revealed a small ulceration at the base of the uvula on the right side. When first seen by Ferrand, the uvula was hypertrophied, and on the right side there was a grayish ulceration which extended to the free border of the palate. To the touch the growth was of a hard character. There were no enlarged glands. All the diseased tissue was removed with the knife, and the parts afterward cauterized with the actual cautery. Five years after the operation there was no recurrence. It is of interest to note that the patient had been a persistent smoker since his fourteenth year. No microscopic examination of the growth appears to have been made, although the patient was seen by Cloquet, who believed it to be of a cancerous nature.

Case X. Reported by White:[1] Under the title of epithelioma of the soft palate, White reports the case of a male aged 66, who presented with a growth the size of a walnut, growing from the uvula, and one of about half the size on the right side of the soft palate. No enlarged glands could be found.

The growths were completely removed with the galvano-cautery knife, and a month after the patient left the hospital, completely cured.

No microscopic examination is reported as having been made, and the incompleteness of the history leaves the diagnosis open to serious question.

Case XI. Reported by Wilken:[2] This was the case of a male aged 51, who, three weeks before he was seen, complained of a soreness of the throat, which was at first thought to be due to the presence of an abscess. Warm gargles were ordered, but these not having the desired effect, a closer examination was made, which revealed the presence of an ulcer, undoubtedly malignant in character, situated on the posterior surface of the right side of the velum, spreading slightly to the lateral wall of the pharynx. There were no enlarged glands.

A radical operation not seeming desirable, the growth was repeatedly cauterized with chloride of zinc. The treatment was of no permanent avail, and the malignant growth in the palate spread to the opposite side, to the posterior wall of the pharynx, and to the mucous membrane of the cheek.

The cancerous cachexia became very well marked, and there is no doubt that the disease terminated fatally, although at the time Wilken reported the case the patient was still alive.

The most curious fact in connection with this case is that up to the latest report no enlarged glands had developed.

Case XII. Reported by Gardner:[3] Under the title of "Malignant Ulceration of the Soft Palate," Gardner reports a case occurring in a male aged 38, who three months before coming under observation noticed a pimple at the angle of the lower jaw at the left side. When first seen, there was an ulcer of the soft palate near the anterior pillar about the size of a halfpenny piece, and an enlarged gland under the angle of the jaw on the same side.

Anti-syphilitic treatment failed to reduce either the gland or the ulceration, and under ether the ulcerated portion was dissected out, apparently without perforating the velum. The enlarged gland was subsequently removed. A month later the patient was admitted with another enlarged gland, which was also taken out. About two and a half months after the first operation all wounds had healed, and the patient was discharged cured. The entire absence

[1] Irish Hosp. Gaz., 1873, vol. i., p. 181.

[2] Inaugural Dissertation, Göttingen, p. 26.

[3] Australian Med. Jour., 1888, n. s., vol. v., p. 195.

of microscopic examination either of the glands or the growth renders the diagnosis open to serious question.

CASE XIII. Reported by Treves:[1] This was the case of a male aged 56, who presented with a tumor on the right side of the palate the size of a chestnut, which had apparently commenced two months previously. The sub-maxillary glands were enlarged, but this condition had existed for some years. The carotid artery was ligated, and the tumor successfully excised and found to be an adenoid carcinoma. The cervical glands also were excised, but showed no cancerous degeneration. Further report is not given.

CASE XIV. Reported by Birkett:[2] A male aged 34 presented with a wart-like growth covering half the surface of the soft palate, which had existed for two months. This was excised and showed no carcinomatous elements. The parts did not heal up, and two months later recurrence took place in connection with an enlargement of the glands at the angle of the jaw. This was treated by escharotics, and death occurred eight months after the first operation. The diagnosis of carcinoma in this case was made purely on the clinical history. This would seem to be a fairly well-established instance of the transformation of a papillomatous growth into an epithelioma.

CASE XV. Reported by Langton:[3] A male aged 59 presented with the history of a tumor of the soft palate, which at the end of three months had attained the size of a walnut. The growth, which was soft and almost fluctuating in its consistency, was successfully removed through the natural passages. Recurrence took place one month later, accompanied with an enlargement of the cervical glands, which had not existed before, and the patient succumbed at the end of another month. There was a secondary deposit found in the lungs.

CASE XVI. Reported by Kilham:[4] A male aged 53 presented with a history of tumor in the fauces, which, apparently commencing in the soft palate, at the end of six months had successively invaded the uvula, pillars of the fauces, and base of the tongue. When first seen, the interference with respiration was so marked as to demand almost immediate laryngotomy. The cervical glands were notably enlarged. Two and a half weeks after admission there was an effusion first in the right and subsequently in the left shoulder joint, and the patient died soon after of pneumonia. A post-mortem examination showed the epiglottis involved by the cancerous invasion. Both shoulder joints contained pus, and there was a large abscess under the right sterno-mastoid muscle. The suppurative process would seem to have been of metastatic origin, a somewhat unusual complication of cancerous disease.

CASE XVII. Reported by Page:[5] A male aged 27 presented with a sluggish ulcer on the soft palate, which had been present for six months, and had followed the removal of a small warty growth about the size of a pea. Its appearance suggesting syphilis, specific remedies were administered without effect, and a month later the parts were thoroughly excised, the incision extending through the whole thickness of the soft palate. The cervical glands were enlarged. Recurrence took place a month later, with an increased infiltration of the cervical glands. Two months later a large portion of the palate was involved in cancerous degeneration, while the cervical glands attained the size of an orange. No further report is made, although we are left to infer that the patient succumbed soon after, as the cancerous cachexia was well

[1] Trans. Path. Soc. Lond., 1884–85, vol. xxxvi., p. 397.
[2] Trans. Path. Soc. Lond., 1859–60, vol. xi., p. 233.
[3] Trans. Clin. Soc. Lond., 1870, vol. iii., p. 861.
[4] Lancet, Lond., April 24th, 1886. [5] Lancet, Lond., March 12th, 1887.

marked. This also would seem to be a fairly well-established instance of cancerous degeneration following a papillomatous growth.

CASE XVIII. Reported by Lauenstein: This was the case of a male aged 65, which is reported without detail further than that the tumor involved the whole palate, and was extirpated after slitting the cheek. It was found to be pure carcinoma. The parts healed up somewhat slowly, and the patient was finally discharged. Further report is not given.

CASE XIX. Reported by Küster: A male aged 49 presented with a history of a tumor of the fauces, which, commencing apparently in the posterior pillar, had at the end of six weeks successively invaded the soft palate, the precoronoid space, and the lateral wall of the oro-pharynx. Access to the growth was attained by slitting the cheek and disarticulating the jaw, and the growth successfully removed. Recurrence took place five and a half months later and a second operation appears to have been successfully done.

CASE XX. Reported by Gross:[3] A male aged 48 presented with the history of a warty growth on the soft palate, extending to the hard palate, which had been present for six months, giving rise to no notable symptoms, painful or otherwise. It was treated with caustics, in spite of which it developed rapidly and eventually became malignant in character. No further report is given.

CASE XXI. Reported by Castex:[4] This observer reports having seen three cases of this affection. The first was that of a male aged 48, who presented with the history of a tumor of the fauces existing for three months, giving rise to dysphagia and neuralgic pains. The surface of the tumor was ulcerated, and there was fetid breath and salivation.

The second case was that of a male aged 50, who for some months had been conscious of a tumor in the fauces, giving rise to notable impairment of the function of the parts. There were no glands enlarged.

His third case was that of a male aged 65, in whom a tumor at the end of three months had attained considerable size, interfering with the function of the parts. The cervical glands were notably enlarged.

In all these cases the tumor seems to have had its origin in the pillars of the fauces. In the last only, however, did the growth extend to the soft palate. In none of these cases was any operative interference undertaken, nor is any further history given.

CASE XXII. Reported by Ledentu: A male aged 56 presented with a history of a tumor, which, commencing in the soft palate, involved successively the pillars of the fauces, the oro-pharynx, and the base of the tongue. The glands of the neck were also involved. The surface of the growth was not ulcerated, and the prominent symptom to which it gave rise was dysphagia. There was no dyspnœa, and yet this patient died of an attack of suffocation, the cause of which does not seem to have been determined. The growth was found to be a cylindrical-celled epithelioma.

CASE XXIII. Reported by Durand-Fardel:[6] A male aged 75 presented with a large, hard, resisting tumor involving the soft palate, which had attained

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[1] Münch. med. Woch., 1889, No. 9, p. 156.
[2] Deut. med. Woch., 1885, vol. xi., p. 860.
[3] "System of Surgery," Phila., 1882, vol. ii., p. 468.
[4] Rev. de Chir., 1886, vol. vi., pp. 305 and 310.
[5] Bull. de la Soc. anat., 1873, vol. xlviii., p. 656.
[6] Bull. de la Soc. anat., 1837, vol. xii., p. 73.

such size as to almost completely fill the faucial opening. It gave rise to dysphagia and dyspnœa. The patient succumbed of suffocation a few days later. An autopsy was made and the growth was found to be scirrhous.

CASE XXIV. Reported by Brissaud:[1] A male aged 45 had suffered for fifteen years from what is described as lingual and buccal psoriasis. During the latter five years of this period a tumor had developed in the hard palate, and subsequently involved the velum. The glands of the neck were enlarged, and the whole mass had latterly assumed a warty appearance. The upper jaw was exsected and the whole mass removed, leaving the velum intact. The growth was found to be tubular epithelioma.

This case does not perhaps belong in the present category, and yet it presents several points of interest. I think we are warranted in the inference that the psoriasis was really a case of leucoplakia, which eventually took on carcinomatous degeneration. Furthermore, the carcinoma assumed the form of cylindroma, already alluded to in our previous discussion of carcinoma of the nasal passages.[2]

CASE XXV. Reported by Chassaignac:[3] This was the case of a young woman, suffering from phthisis, in whom a tumor of the soft palate made its appearance and grew with such rapidity that, despite her critical general condition, an operation became necessary on account of the local symptoms. The patient died three weeks later. It is reported as cancer.

CASE XXVI. Reported by Adams:[4] This was the case of a male aged 30, in whom a tumor the size of a walnut developed in the soft palate, and was successfully ligated. The case is reported as scirrhous, although it seems a somewhat questionable diagnosis.

CASE XXVII. Reported by Blandin:[5] This was a male aged 49, in whom a tumor developed in the soft palate, which at the end of three months had attained such size as to give rise to notable dysphagia and dyspnœa. A ligature was placed around the growth, and it sloughed away at the end of four days. It was reported as cancer.

CASE XXVIII. Reported by Panas:[6] This was the case of a male, in whom a tumor had, at the end of eight months, assumed such proportions as to cause notable dysphagia and dyspnœa, this latter symptom demanding laryngo-tracheotomy. No attempt was made to extirpate the growth, and the patient died suddenly from hemorrhage through the tracheotomy tube a month later.

CASE XXIX. Reported by Skey:[7] This was a male aged 43, in whom a tumor commencing in the soft palate had, at the end of six months, not only invaded all the tissues of the velum, but had extended somewhat to the nard palate and the gums on either side. The patient was cachectic, and no operation was done. The inference, therefore, is that death occurred very soon after.

CASE XXX. Reported by Coulson:[8] This was a male aged 25, in whom a tumor involving the soft palate had attained such size at the end of five months as to produce notable dyspnœa and suffocative attacks. The neoplasm was excised, but was followed soon after by recurrence, and the patient suc-

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[1] Bull. de la Soc. anat., 1876, vol. li., p. 608. [2] Vol. i., p. 463.
[3] Bull. de la Soc. de Chir. de Paris, 1849, 1st series, vol. i., p. 330.
[4] London Medical Gazette, 1846, new series, vol. iii., p. 836.
[5] Gaz. des Hôpitaux, 1845, p. 86.
[6] Bull. de la Soc. de Chir., 1871, 2d series, vol. xii., p. 205.
[7] Medical Times and Gazette, London, 1860, vol. i., p. 290.
[8] London Medical Gazette, 1831–32, vol. ix., p. 781.

cumbed from a sudden attack of hemorrhage four months later. An autopsy showed the glands at the base of the tongue, and also the tonsils, involved in the same morbid process. The case is reported as cancer.

ETIOLOGY.—Perhaps the most striking fact elicited by a review of the above cases is the remarkable predominance of male victims to carcinoma of the velum and pillars, in that the only case reported of carcinoma of this region occurring in a female is that of Chassaignac. Of course this can only be regarded as a coincidence, and, while somewhat remarkable, one possessing no clinical importance.

As regards age, we find two cases occurring in the third decade of life, one in the fourth, five in the fifth, four in the sixth, two in the seventh, and one in the eighth, the majority of cases, of course, occurring beyond middle life, thus obeying the ordinary rule in regard to malignant disease.

The only other fact which is of interest in regard to etiology is the apparent development of malignant disease from non-malignant in Cases XIV., XVII., XX., and XXIV. This question, however, belongs more especially to pathology.

PATHOLOGY.—I think it a somewhat noticeable fact, in carcinoma of the soft palate, that it shows a tendency, at least, to confine itself to the tissues of the velum. Certainly a review of the cases reported in literature would seem to establish this fact, or else they show that a cancer in this region runs such a rapid course that it produces death before neighboring regions have been invaded. Of course this is rather a tendency than an observable fact, since evidence of extension has been observed in all cases.

An investigation of the primary origin of cancer in the soft palate would necessarily be somewhat speculative. Its probable source, however, is to be sought either in the muscular tissue or the muciparous glands, presumably the latter, since cancer of muscular tissue is exceedingly rare. The glands, as we know, penetrate the muscular tissues; hence, these structures are involved secondarily. Its further extension would seem to have some respect to the anatomical character of the surrounding structures. Thus, while, as before stated, in most cases the disease confines itself to the soft palate, its most frequent extension is through the pillars, as occurred in the cases of Kilham, Le Dentu, and Chassaignac, and also the third case of Castex, while its still further extension in the former of these was respectively to the tongue, uvula and epiglottis, the tongue and oro-pharynx, and the pharynx. In Skey's case, the extension was both to the hard palate and gums. In Coulson's case, alone, it appears that the lymphatic tissues of the faucial tonsil and the base of the tongue were involved,

thus apparently violating the rule, in directly involving a different anatomical structure. In Castex's first two cases, and in Küster's, the disease began in the pillars of the fauces, remaining in this structure in Castex's first case, while in his second it extended to the base of the tongue. In Küster's the extension was in both directions, still through the mucous membrane, respectively to the lateral wall of the pharynx and to the velum.

We thus find a very notable disposition of carcinoma of the fauces, where it commences in the glandular structures, to avoid the lymphatic tissues in its extension. In those cases, however, in which it commences in the lymphatic structure, as in the tonsil, it shows no hesitancy whatever in invading the other tissues, such as the glandular or muscular structure of the soft palate and other surrounding parts.

Most of these cases have been reported as simply carcinoma or cancer, although the clinical histories would seem to indicate that the majority of instances were epithelial in character. Treve's case is reported as adeno-carcinoma, Le Dentu's as cylindrical-celled epithelioma, while Brissaud's case is reported as a tubular epithelioma. This latter case is of special interest as presenting us, beyond question, with an instance of an epithelioma taking on the tubular form, and undergoing mucoid degeneration, in the manner described by Joüon,[1] thus giving rise to a tumor which is essentially benign in character. In Gross' case an apparently benign warty growth of six months' standing took on malignant action. This we regard usually as an exceedingly rare event, but, considering that it was reported by so careful an observer as Gross, must be accepted as an undoubted instance of this transformation. It is altogether probable that a similar process occurred in the cases reported by Page and Birkett. A careful reading of Brissaud's case warrants the suggestion that the buccal and lingual disease from which the patient suffered was really leucoplakia, and that malignant transformation occurred after about ten years, thus apparently confirming the observations of Schwimmer,[2] Vidal,[3] and others, who believe that such degeneration is by no means an uncommon result in leucoplakia. The ultimate connection between the lymphatics of the soft palate and of the cervical region will easily explain why these latter were involved early in the history of every case reported.

SYMPTOMATOLOGY.—The early stages of the development of a cancer in the palate give rise ordinarily to no symptoms other

[1] Bull. de la Soc. anat. de Nantes, 5th year (séance of Feb., 1881), Paris, 1882, p. 22.
[2] Transactions of the Seventh International Congress, London, 1881, vol. iii., p. 172.
[3] L'Union Méd., 1883, vol. xxxv.

than a certain amount of mechanical interference with deglutition, while at the same time the voice assumes a muffled tone, its nasal resonance being absent according as the tumor obstructs the palato-pharyngeal opening.

The mucous membrane covering the tumor is not usually inflamed, and there is no hypersecretion.

As the tumor increases in size these symptoms become more marked, and we have also the additional symptom, in certain cases, of dyspnœa, according as the growth projects over the orifice of the larynx.

Pain, which we usually find so characteristic of cancerous growth, does not seem to have been present in many of the cases reported, although this was a somewhat prominent symptom in the first case reported by Castex. The absence of pain is probably to be explained by the fact that the growth develops in a soft and yielding tissue, and furthermore that the disease runs a somewhat rapid course.

In a certain proportion of cases ulceration occurred comparatively early in the history of the disease. Where this feature developed it was attended of course with the ordinary fetid and ill-smelling discharge so characteristic of cancerous degeneration.

I find no note made in any case either of mild or excessive hemorrhage from the ulcerated surface during the progress of the disease; although the sudden occurrence of the latter is reported as having been the cause of death in Panas' and Coulson's cases. In the former of these the source of the bleeding was obscure, while in the latter it followed a recurrence of the disease after operation.

The dyspnœa in Panas' and Kilham's cases became so urgent as to demand tracheotomy, while Le Dentu's and Durand-Fardel's cases died of suffocation. This symptom seems to have been due to the interference with the passage of air into the larynx, and not to any secondary affection of the air-passages below; although in Panas' case the excessive enlargement of the cervical glands was supposed to have caused stenosis of the larynx by external pressure.

The early development of the cancerous cachexia seems to have been a notable characteristic of the disease, in that in all cases where this is specially noted it occurred within a few months after the commencement of the affection.

DIAGNOSIS.—The tumors which are found in this region are papilloma, adenoma, fibroma, sarcoma, and carcinoma.

Papilloma is a comparatively rare disease, and presents gross appearances which are characteristic and distinct. Its main inter-

est in this connection is its possible danger of developing into malignant disease.

Adenoma is the most frequent of all neoplasms. It develops very insidiously, and its progress is exceedingly slow, running a course of from ten to twenty years even, and never gives rise to an ulcerative process except by attrition with the surrounding parts, as occurred in Hutchinson's case alluded to elsewhere.

Fibroma is exceedingly rare, develops insidiously, and grows very slowly; moreover, it usually forms a pedunculated tumor, which is quite freely movable.

There should be therefore but little difficulty in distinguishing carcinoma from any of the above neoplasms. The main diagnostic interest in this connection would lie in the differentiation of a sarcoma from a carcinoma. In one case we have a rounded, fleshy tumor, somewhat soft in consistency, rarely ulcerating, developing insidiously, and progressing somewhat slowly. In carcinoma, on the other hand, we have a rapidly developing tumor, usually of a nodulated outline, presenting a dense, cartilaginous feeling to the touch, and of a pinkish-white color, in contradistinction to the red, fleshy look of a sarcoma. In addition to this, the cervical glands are almost invariably affected early in the history of carcinoma, while this complication is absent as a rule in sarcoma, or occurs quite late in the history of the disease.

Our final and decisive judgment, of course, is only to be based on the removal of a portion of the tumor for microscopic examination.

PROGNOSIS.—It is scarcely necessary to state that the prognosis in these cases is exceedingly unfavorable. I find in the above reported cases that in five instances death occurred without operative interference. The longest time which the patient survived the disease was nine months, while the shortest was seven, excluding Le Dentu's case, in which death occurred six months after the commencement of the attack, not directly from the ravages of the disease, but from suffocation. Five cases were subjected to operative interference, followed by death in from one to ten months. The longest period of survival in any of these cases was that of Birkett, viz., ten months from the commencement of the affection. There was recurrence in each instance in from one to five and a half months, with the exception of Chassaignac's, which died three weeks after the operation. Brissaud's case, as we have already seen, was cylindroma, and practically non-malignant in character, hence it should not enter into this analysis. In the other cases reported the details are so imperfect as to render them of no prognostic value, with the exception of Küster's, Ferrand's, Treves', and

Lauenstein's. The two latter of these are simply reported as successful operations without detail, while Küster's was operated on by lateral pharyngotomy and, recurring five and a half months later, was subjected to a second operation, which we are left to infer was successful, the patient being discharged after the operation. In Ferrand's case there was no recurrence at the end of five years. I do not think, however, that we are warranted in accepting any of these cases as instances of a radical cure of cancer of the palate with the possible exception of Ferrand's case, in which, however, no microscopic examination was made. If this view is justified, we are compelled to conclude that, when the palate is invaded by carcinomatous disease, a fatal termination may be expected, certainly within twelve months and probably within nine.

TREATMENT.—In view of the excessive fatality which has attended the disease in the cases above reported, and the almost entire failure of such operative measures as have been resorted to in arresting the progress of the disease, any suggestions as regards treatment would seem almost unnecessary; and yet we are scarcely warranted from the above analysis in concluding that the operative measures have not been of service; for, whereas we fail to determine that life has been notably prolonged, we certainly must recognize the fact that the comfort of the patient has been ministered to in no small measure, when we note that after the removal of the tumor a recurrence has been postponed in one instance as long as five and a half months. The teaching of this one case seems to be clear in demonstrating the fact that, whereas the disease cannot be cured, a certain amount of relief may be afforded by a radical operation.

I have no disposition to criticise the operations in the cases reported above, and yet I think to any one reading them carefully must come the suggestion that the operations were not perhaps of the most radical character; hence, when we consider the great advances made in modern surgical methods, and the striking success oftentimes achieved in daring surgical procedures, it would seem not impossible that a better hope for the successful extirpation of these malignant tumors of the soft palate might be afforded by somewhat more extensive operative interference.

This suggestion is notably emphasized by a consideration of the remarkable success alluded to elsewhere, achieved by Iversen in the treatment of carcinoma of the pharynx.

Carcinoma of the Tonsil.

When we consider that carcinoma belongs essentially to the later years of life, and to a period when the peculiar structure of which the tonsil is composed is inert, and practically in a state of atrophy, we should naturally suppose that this region would be comparatively free from the primary invasion of malignant disease. This is true when we compare the frequency of cancer in the tonsil with its frequency in other regions of the body; but when we compare the frequency with which the tonsil is invaded, with other regions of the fauces, we find that in the very large majority of instances the disease apparently has its primary origin in this gland, although subsequently it may invade the soft palate, pillars of the fauces, base of the tongue, and other regions. Thus, Lebert,[1] out of 9,118 cases, finds the growth originating in the tonsil in 3; while Sibley,[2] out of 520 cases, finds the growth primarily in the tonsil, palate, and parotid in 6 cases; and Baker,[3] out of 500 cases, finds the tonsils the primary seat of the disease in 2 instances. Walsh[4] also reports that, in 8,289 deaths from cancer registered in Paris, in but 3 were the tonsils involved.

Gürlt,[5] out of 11,131 cases of carcinoma, observed the tonsil affected in 6; while Winniwarter,[6] out of 548 cases of carcinoma in different parts of the body, found the tonsil to be the primary seat of the disease in one case.

As indicating the frequency of its occurrence as compared with other affections of the throat, Lennox Browne[7] states that in a practice extending over twenty years he has seen 12 cases, or one case in every 5,000; while Mackenzie[8] records 7 cases as having come under his observation. Mickulicz[9] has also seen 7 cases; Weber[10] and Velpeau[11] each saw 5 cases. Bryant[12] saw 4 cases; Whistler,[13] Cavazzani,[14] and Bird[15] each saw 3 cases; Cheever,[16]

[1] "Traité des Mal. cancér.," Paris, 1851, p. 93.

[2] Med.-Chir. Trans., vol. xlii., p. 111. [3] Med.-Chir. Trans., vol. xlv., p. 389.

[4] "Nature and Treatment of Cancer," 1846, pp. 265–267.

[5] Arch. für klin. Chir., 1880, Bd. xxv., p. 426.

[6] "Beiträge zur Statistik der Carcinome," Stuttgart, 1878.

[7] "Throat and its Diseases," 2d edition, London, 1887, p. 242.

[8] "Diseases of the Throat and Nose," Am. ed., Philadelphia, 1880, vol. i., p. 96.

[9] Deut. med. Woch., 1884, vol. x., p. 33. Ibid., 1886, vol. xii., p. 157.

[10] Billroth's "Handbuch der allg. und spec. Chir.," Bd. iii., Abth. 1.

[11] "Traité de Méd. opérat.," 2d ed., vol. iii., p. 568.

[12] Guy's Hospital Reports, 1863 to 1869.

[13] Medical Times and Gazette, London, 1883, vol. i., p. 579.

[14] Rev. Veneta de Sci. med., 1888, vol. viii., p. 382.

[15] British Medical Journal, 1882, vol. ii., p. 664.

[16] Boston Medical and Surgical Journal, 1869, n. s., vol. liii., pp. 54–57. Ibidem, 1878, vol. xcix., p. 133.

Erichsen,[1] Pierin,[2] and Langenbeck[3] each saw 2; while further observations, with reports of cases, have been made by Vogel,[4] Lobestein,[5] Roux,[6] Desormeaux,[7] Houël,[8] Lawrence,[9] Foulis,[10] Quintin,[11] Albert,[12] Froelich,[13] Delavan,[14] Lucas,[15] Alsberg,[16] Cozzolino,[17] Donaldson,[18] Campbell,[19] Barker,[20] Pean,[21] Leclerc,[22] Sevestre,[23] Massucci,[24] Bottini,[25] Lennox Browne,[26] Küster,[27] Labbé,[28] Ozenne,[29] Quinquand,[30] Castex,[31] Fowler,[32] Polaillon,[33] Burnett,[34] Warren,[35] Derecq,[36] Lasègue,[37] Coppez,[38] Billroth,[39] Vidal de Cassis,[40] and Weiss.[41]

The above cases are reported as instances of primary involvement of the tonsil. Many other instances are found in literature in which malignant disease of the neighboring parts has subsequently involved the tonsils. These, however, do not belong to the present consideration.

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[1] "Science and Art of Surgery," Philadelphia, 1873, vol. ii., p. 480.
[2] Thèse de Paris, 1879, No. 239.
[3] Jahresb. der gesammt. Med., 1869, vol. ii., p. 435.
[4] "Chirurg. Wahrn.," Lubeck, 1780.
[5] "Traité d'Anat. path.," Paris, 1829, vol. i., p. 430.
[6] Bull. de la Soc. anat., Paris, 1846, vol. xxi., p. 109.
[7] Bull. de la Soc. de Chir. de Paris, 1859, vol. ix., p. 162.
[8] Bull. de la Soc. de Chir. de Paris, 1859, vol. ix., p. 162.
[9] "Lectures on Surgery," 1863, p. 611.
[10] Brit. Med. Journ., Oct., 1875.
[11] Separatabdrück aus den Annales de la Soc. de Med. de Gand, 1877.
[12] "Lehrbuch der Chir.," Wien, 1881, vol. i., p. 351.
[13] "Ueber Tonsillarpolypen u. Geschwülste des weichen Gaumens," Göttingen, 1880, p. 41.
[14] New York Medical Journal, 1882, vol. xxxv., p. 370.
[15] Brit. Med. Journ., 1882, vol. ii., p. 790.
[16] Arch. für klin. Chir., 1882–83, vol. xxviii., p. 728.
[17] Morgagni, 1884, No. 26.
[18] New York Medical Record, 1885, vol. xxvii., p. 262.
[19] Liverpool Med. and Chir. Journal, 1885, vol. v., p. 28.
[20] Lancet, London, 1887, vol. ii., p. 1110.
[21] Leçon. Clin. chir. (1883–84), Paris, 1888, vol. vi., p. 719.
[22] Normandie Méd., 1888, 4th year, p. 177.
[23] Bull. de la Soc. anat., Paris, 1872, 3d series, vol. vii., p. 322.
[24] Rivista clinica dell' Università di Napoli, 1884, No. 6.
[25] Gazetta degli Ospitali, 1886, No. 43.
[26] Trans. Path. Soc. London, 1879, vol. xxx., p. 407.
[27] Deutsch. med. Woch., 1885, vol. xi., p. 859.
[28] Bull. de la Acad. de Méd., 1882, p. 837.
[29] Bull. de la Soc. anat., 1883, vol. lviii., p. 123.
[30] Annal. des Mal. de l'Oreille, 1877, p. 108.
[31] Rev. de Chir., 1886, vol. vi., pp. 44, 130, and 304.
[32] Brooklyn Med. Journal, 1888, vol. ii., p. 181.
[33] Gaz. des Hôpit., 1888, vol. lvi., p. 266.
[34] Tanner's "Practice of Medicine," vol. ii., p. 11.
[35] Warren: "Tumors," p. 356.
[36] Thèse de Paris, 1887, No. 127, pp. 37, 39, and 43.
[37] Cited by Passaquay: Thèse de Paris, 1873, No. 219, p. 69.
[38] Cited by Froelich: Inaug. Dissert., Göttingen, 1880, p. 41.
[39] Deutsche Klinik, 1856, p. 66.
[40] "Path. externe," Paris, 1840, vol. iv., p. 250.
[41] Rev. méd. de l'Est, 1881, vol. xiii., p. 705.

ETIOLOGY.—That the tonsil should present a more favorable site for the development of cancer than the fauces, is, perhaps, not difficult to understand when we remember the character of the tissue found there, composed as it is almost entirely of epithelial structure; but, as already suggested, the fact of this structure in adult life being the seat of such feeble functional and nutritive activity must explain the exceeding rarity of malignant disease here as compared with other portions of the body.

As regards the age at which it occurs, we find here the same rule as governs the development of carcinoma generally. Of the cases reported, the average age is about fifty-two and one-half, the oldest instance recorded, as far as I know, being that of Quinquand,[1] at the age of eighty-two; while the case reported by Bryant is certainly very striking, in that the age of the patient was but seventeen. In both these cases the growth was of the scirrhous variety; the former being a female, while Bryant's case was that of a boy. One of Mackenzie's cases occurred at twenty-two, and another at thirty-seven, both in males; while one at thirty-four was a female, the disease being encephaloid in the former and scirrhous in the latter. Malignant disease, as a rule, is met with among females more frequently than among males; yet, curiously enough, when it involves the tonsil, the males outnumber the females more than two to one. This carries with it the suggestion that the out-of-door life and the exposure to which men are subjected may have some indirect influence in predisposing to the development of malignant disease, through the more aggravated forms of throat disease which this life entails.

The use of tobacco is said to have some influence on the development of buccal and faucial carcinoma. Statistics, however, do not seem to support this suggestion, certainly in reference to the development of the disease in the tonsil. The same probably can be said in regard to the use of alcohol.

PATHOLOGY.—Butlin[2] makes the assertion that sarcoma is the most common form of malignant disease found in the tonsil, basing his statement on the fact that this organ is composed very largely of round-cell tissue, referring undoubtedly to the lymphatic structure of the tonsil. In the cases above reported it is difficult to determine, with any degree of accuracy, how many had their primary origin in the tonsil; but we are bound to conclude, from the character of the reports, that a very large number of these instances were really cases of primary malignant disease of this structure.

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[1] Loc. cit.

[2] "Sarcoma and Carcinoma," London, 1882, p. 188. "Malignant Disease of the Larynx," London, 1883, p. 13.

Statistics, I think, will show that carcinoma is much more frequent than sarcoma. Now, when we come to investigate the particular form which the cancerous disease assumes, we are met with something of confusion in classification, in that the different reporters are somewhat vague in this respect. It is easily seen, however, that, in the very large majority of instances, cancer of the tonsil manifests itself in the form of epithelioma. Why this should be true, we can easily understand from the minute anatomy and the development of the organ. As has already been shown, at the time of life when cancer develops, the lymphatic structures of the tonsil have undergone certain retrograde changes, which render them to a certain extent inert. The epithelial structures, on the other hand, persist, and retain both their nutritive and functional activity. Now, if, as the result of heredity, local irritation, or some other obscure cause, the nutritive activity or normal cell proliferation, which at the early period of life has been maintained, undergoes an abnormal increase, we have the conditions which may prove the starting-point of carcinoma; which we may state, briefly, to be an unusual and abnormal development of the epithelial cells, which development or proliferation, under the stress of activity, instead of being exfoliated on the surface, burrow down upon and into the normal tissues beneath.

After the tumor is fully developed and has manifested itself in malignancy, the rapid development of cells results in an ulceration on the surface. This appears to be in part due to mechanical causes, and is perhaps the result of external irritation and pressure. In the main, however, the ulcerative process in epithelioma arises from the crowding together of the cells on the surface, and the casting off of the superficial cells in a state of necrosis. When developed, the tumor presents the ordinary histological characteristics of epithelioma in any part of the body, except so far as they are modified by the tissue in which it develops. This has already been fully described.[1] After development, its extension is somewhat rapid, spreading first to the pillars of the fauces and soft palate, and subsequently to the base of the tongue. It seems to show a certain amount of hesitancy in extending backward, in that the pharynx is usually the latest to become involved, and in many instances escapes entirely. It also extends forward over the precoronoid space and into the tissues of the cheek, as in Küster's case and in a case which came under my own observation.

As the result of the close and intimate connection between the lymphatics of the tonsil and the cervical region, secondary engorgement occurs very early in the history of the disease, and becomes

[1] Vol. i., p. 614.

a prominent feature in its course. This was strikingly illustrated in the cases reported by Mayor,[1] Gueillot,[2] and Le Tulle,[3] where a somewhat insignificant malignant tumor behind or below the tonsil gave rise to a very large secondary cancerous mass in the cervical region, which really became the prominent feature of the morbid process.

The disease is usually unilateral, and there seems to be no reason why the tonsil of the opposite side should become involved, although in Delavan's case the other tonsil is reported as having become enlarged, though it is not stated that this enlargement was malignant.

On account of the rich distribution of lymphatics in the neighborhood of the tonsil and its close connection with the cervical glands, we might infer that generalization of the disease might not be uncommon; yet the clinical history of the cases observed would seem to indicate that this is not a result to be anticipated.

SYMPTOMATOLOGY.—The earliest symptom to which the disease usually gives rise is that of pain of a somewhat sharp and lancinating character on deglutition, which increases somewhat rapidly with the development of the tumor, until it finally becomes an almost constant symptom, not only when the parts are in motion, but also when at rest. This pain is usually referred to the faucial region, but extends in the direction of the ear. In some cases the pain seems to locate itself in the ear entirely, giving rise to no symptoms which direct attention to the throat. This was notably true of Delavan's and Lennox Browne's cases; the former of these being treated several weeks for the ear symptoms before attention was directed to the fauces.

The increased flow of saliva is a constant and somewhat prominent symptom, commencing quite early in the history of the disease. This may possibly be due to an increased secretion as the result of stimulation of the salivary glands, although it is more probable that the enforced rest which the pain on deglutition compels the patient to give the faucial muscles, and the absence of attempts at deglutition, result in his allowing the saliva to accumulate in the mouth in much the same manner as occurs in quinsy.

The voice is affected according to the size of the growth, and is merely the result of mechanical interference with the free play of the muscles and the exit of the vocal waves.

The secondary enlargement of the cervical lymphatics occurs very early in the history of the disease, and has been present in every instance reported, with the exception of Barker's case, in

[1] Progrès méd., 1879, vol. vii., pp. 166 and 245.
[2] Ibid., 1880, vol. viii., p. 1017. [3] Ibid., vol. vii., p. 167.

which there was no secondary enlargement at the end of several months, although the tumor had been scraped several times. This glandular enlargement assumes a considerable degree of prominence, and may make its appearance and attain a large size even before the attention of the patient has been notably called to the existence of any faucial disorder. This feature was particularly notable in Campbell's case,[1] a man aged forty-one, who remained for three weeks under the delusion that he was suffering from an attack of the mumps, when finally the tonsillar disease was discovered. The cervical invasion comes on suddenly, and assumes large proportions from the outset, after which, as the disease in the fauces progresses, the cervical glands enlarge somewhat slowly. When the disease has once fixed itself in the tonsil, it runs a rapid course, causing this infiltration of the cervical lymphatics very early in its history; after which this secondary enlargement remains practically quiescent. A suppuration of these tissues may occur, although this is comparatively rare.

The primary development of an epithelial cancer being superficial, we can easily understand why ulceration should occur early in its history. This is true as regards any portion of the body, but perhaps more noticeably where the disease invades the faucial region than any other portion of the economy, owing to the fact that this region is in a state of constant functional activity, and furthermore that any disease process is necessarily aggravated by constant movement and attrition. Ulceration usually occurs during the second or third month of the disease, very rarely being delayed beyond the fourth month; although in Whistler's case no ulceration had taken place at the end of six months. When this symptom sets in, there is a noticeable increase of the secretions, which are of a whitish-gray color and of a somewhat tenacious consistency. The secretion from the surface of the tumor is not of an excessive amount, but the development of the ulcerative process is attended with an increase of the localized inflammation of the mucous membrane of the surrounding tissues, and as a result an increased secretion of mucus from this source. The discharge from the ulcerated surface is not infrequently tinged with blood from the rupture of minute blood-vessels invaded by the disease. Of course no blood-vessel is safe from erosion which lies in the track of the ulcerative process, hence an excessive hemorrhage may occur if the tonsillar or ascending pharyngeal arteries are involved, and this, though fortunately rare, is a complication that is liable to occur. Thus, in Barker's case, death resulted from exhaustion after repeated hemorrhages, whose source may have been

[1] Liverpool Med. and Chir. Journ., 1885, vol. v., p. 28.

in the above blood-vessels; while in a case reported by Heiberg the internal carotid artery was eroded, causing death by hemorrhage.

Cough is not infrequently present, as the result either of the secretions in the fauces or some slight secondary laryngitis or bronchitis.

Coincident with the development of the ulcerative process the breath becomes fetid and somewhat offensive. The further development of local symptoms is dependent mainly on the proportions to which the growth attains and the direction in which it extends. As a rule, this latter is into the soft palate and base of the tongue and forward into the cheeks, thus giving rise to more marked difficulty in deglutition. If it extends backward toward the larynx, and encroaches upon its lumen, dyspnœa may occur merely as the result of mechanical interference with the entrance of air to the lungs; or, as occurred in a case reported by Browne,[1] œdema of the larynx may set in. If the tumor presses upon or in any way includes the Eustachian tube, the hearing may become notably impaired, as occurred in one of the cases cited by Pierin.[3] We should naturally suppose that this would be a very frequent complication, yet it is somewhat rare owing to the fact, as Castex[4] suggests, that the disease does not readily pass over the posterior pillar of the fauces into the tissues beyond.

Comparatively early in the history of the disease, the patient commences to feel somewhat the effect of impaired nutrition, as shown by the loss of weight and slow emaciation. This is early followed by that peculiar condition which we recognize as constituting the cancerous cachexia, which is probably to be considered as a form of blood-poisoning. It certainly is something more than a condition of general debility due to interference with nutrition, which manifests itself largely in mere loss of flesh; while the curious leaden pallor of the skin, dulness of eye, sunken cheeks, and feebleness of movement constitute a condition which is peculiar to cancerous disease alone.

Diagnosis.—The mere fact of a tonsil becoming enlarged in size, or the seat of any neoplasm in adult life, carries with it the suspicion that this augmentation is due to malignant disease, especially if the enlargement is unilateral. Of course mere hypertrophy of a single tonsil in adult life is not an unusual thing to meet with; but if we meet with a case in which the clinical history shows clearly that a unilateral increase of size in the tonsil has

[1] "Ugeskrift for Laeger," 1885, p. 205.
[2] "The Throat and its Diseases," 2d edit., London, 1887, p. 249
[3] Op. cit. [4] Revue de Chir., 1886, vol. vi., p. 58.

been the result of recent development, in a patient between the ages of forty-five and sixty, the probabilities very largely point toward its being a malignant process.

Any tumor which, developing near the tonsil, presses it out of its bed and causes it to protrude into the fauces, might possibly lead to an error in diagnosis, and yet it must be remembered that, when this occurs, the tonsil preserves its characteristic appearance of a soft whitish-gray mammillated surface, marked by the numerous orifices of the normal crypts; while malignant disease, fixing itself on this organ, changes the whole gross aspect of the tissue, and shows itself by notable appearances to be a true neoplasm.

There is something in the appearance of cancerous disease which is characteristic and almost unmistakable when it presents itself in superficial structures. The onset of the disease is marked by a cellular infiltration of the tissues immediately beneath the mucous membrane covering the surface of the tonsil. As the result of this, the blood-vessels are displaced, the surface of the tonsil becomes bleached, as it were, and presents a peculiar white aspect covered by shining mucous membrane, which, still maintaining its normal state, is stretched to an unusual degree. It presents, therefore, a dry, glazed aspect with a suggestion of thinness and transparency, through which we see a mass of what appears to be morbid tissue beneath. The normal mammillated surface of the tonsil is thus converted into a number of somewhat large rounded lobules. Here and there are seen minute blood-vessels traversing the tissues immediately beneath the mucous membrane, and standing out prominent and well defined over the white background. This definition, as we may call it, of these minute blood-vessels is especially marked round the edges of the tonsil, and it seems to me constitutes a feature of the early development of malignant disease which possesses a certain amount of diagnostic value. The further changes consist in a more or less rapid increase in size of the organ, until, as the result of crowding of the tissues by the new deposit, the superficial layer breaks down and an ulcerated process is the result. The ulcerated process presents appearances which also are quite characteristic. The surface presents a fine, almost granular appearance, is of a whitish color, with a slightly bluish or pinkish tinge, and is usually traversed by minute fissures, and is coated with a scanty, whitish-gray secretion. As the ulceration extends, and its surface increases, these fissures also increase in extent and depth. The edges of the ulceration are usually raised somewhat above the ordinary surface, to meet a raising up, as it were, of the mucous membrane which overlaps it, the two surfaces meeting apparently at the apex of a circumvallate ridge, while the

whole is surrounded by a well-marked areola of redness. This areola, moreover, is notably of a bright red, somewhat scarlet, color, in contradistinction to the redness of the venous plethora. As the disease progresses and extends beyond the tonsil into the tissues of the surrounding parts, we have developed a new condition, which we may describe as a cauliflower-like appearance of the growth. In this we find the edges of the ulcer completely everted and lying over upon the mucous membrane beyond, in such a way that somewhat extensive flaps here and there can be raised up by means of a probe and turned back again upon the ulcerated part. This, of course, is simply to be taken as an evidence of the rapidity of cellular infiltration on the diseased surface, whereby the superficial area of the ulceration is larger than the superficial area of the mucous membrane which has been destroyed. On palpation with the finger, both before ulceration and later, the diseased surface gives the sensation of density and resistance which is almost unmistakable. This is particularly noticeable after the ulceration has occurred, when, on passing the finger over it, the different lobules which make up the growth easily differentiate themselves under the touch, and give forth a sensation of hardness which is simulated by no other diseased condition.

The diagnosis, then, should not present many points of great difficulty. The mere fact of the development of a tumor of the tonsil in adult life, which is non-inflammatory, immediately suggests to us the probability of malignant disease. Palpation and inspection adding to this, by showing us the peculiar density and hardness of the growth, go still further in eliminating any doubt as to the character of the tumor. The occurrence of ulceration furnishes us with still further diagnostic information, not only by its occurrence, but also by its presenting peculiar characteristics which should not be mistaken, I think, for any other form of ulcerative action.

We are frequently told that the appearance of a syphilitic ulcer may easily simulate that of malignant disease, and indeed some authors lay a special stress on the diagnostic points of difference between the two. It seems to me these differences are much overstated. A syphilitic ulcer in this region is usually of the tertiary variety, which possesses three characteristics: the surface of the ulcer is deeply excavated and is below the level of the mucous membrane surrounding it; the edges overhang the ulcer; its surface is coated with bright yellow pus, interspersed with black necrotic tissue; while the areola is of a deep dark purplish-red color. In carcinoma the surface is of a whitish color, covered very sparsely with secretion; there is no pus or necrotic tissue present; the edges of the ulcer overhang the surrounding tissues; while the

areola is of a light red color. The appearances of the two forms of ulceration, therefore, when closely and carefully studied, differ in a marked degree in every characteristic.

A tuberculous ulcer presents appearances which are very much more those of a carcinoma than a syphilitic ulcer; and yet in the tuberculous disease there is neither areola nor induration of the tissues; while, furthermore, it never appears in this region except with a very marked tuberculous cachexia.

PROGNOSIS.—As has been already suggested, malignant disease in this region runs a somewhat rapid course, owing to the constant motion and attrition to which the parts are subjected. For this reason, therefore, carcinoma of the tonsil becomes an exceedingly grave affection.

Of the cases above referred to, in many instances the reports are incomplete, and in others references have been made to cases which have never been reported with any detail. From the remainder, however, I think we may obtain some rather valuable and suggestive information as bearing on the prognosis of the disease.

In a number of the above cases, no operation was attempted, and the disease was allowed to run its course, except so far as local and palliative measures may have influenced its progress. Of these, Delavan's [1] case, a male aged sixty, died at the end of six months. In Hartmann's,[2] a male aged thirty-seven, death occurred probably in sixteen months after the commencement of the disease. Massucci's [3] case, a male aged forty-eight, succumbed to the disease at the end of only two months; while in Campbell's [4] case, a male aged forty-one, death occurred in nine weeks. Leclerc's [5] case, a male aged thirty-two, survived the disease seven months. Quinquand's [6] case occurred in a female aged eighty-two, and resulted fatally at the end of about three months. Sevestre's [7] case, a male aged fifty-five, survived about six months.

We find here seven cases, six males and one female, with ages varying from thirty-two to eighty-two, in which the disease ran its course, without operative interference, in from two to sixteen months. There is nothing in these histories to indicate any controlling or influencing circumstances which hastened or retarded the fatal termination of the disease, unless possibly we except Sevestre's case, which was complicated with pulmonary disease. Heiberg's [8] case has already been alluded to as succumbing from hemorrhage.

It would seem, then, that we should regard carcinoma of the

[1] Loc. cit. [2] Cited by Castex. [3] Loc. cit. [4] Loc. cit.
[5] Loc. cit. [6] Loc. cit. [7] Loc. cit. [8] Loc. cit.

tonsil as a disease which, if allowed to run its course without interference, will certainly result in a fatal termination in from twelve to eighteen months; and yet the above cases are instances in which the disease ran such a rapid course, and evinced such unfavorable symptoms early in its history, that any radical operation was regarded as hopeless.

When, however, we come to investigate those cases which were operated upon, we find that in Péan's[1] case, although the disease had existed two years, he still regarded it as one favorable for operation; and in Mikulicz's[2] case, an operation was done at the end of sixteen months. In Donaldson's[3] case, a male aged sixty-four, the disease had run a course of six weeks; while in one of the cases reported by Castex,[4] a male aged forty-six, the disease had existed for nine months. No further report is given of these cases, no operation being undertaken. The second case reported by Castex,[5] a male aged sixty-four, is somewhat curious, in that an induration of the cervical lymphatics, the size of a mandarin, had existed for two years, while symptoms referable to the fauces had only manifested themselves within two months. Castex regarded this cervical adenopathy as of a cancerous nature, although it would seem a more rational explanation to regard the primary cervical symptoms as non-malignant. No operation was done in this case, and no further history is given. In Lennox Browne's[6] case, the course of the disease seems to have been retarded somewhat by the repeated use of the galvano-cautery, although the subsequent history is not reported. In Barker's[7] case, the neoplasm was scraped three separate times, each curetting being followed by a period of apparent arrest for from two to three months before recurrence set in, the patient's life being ultimately prolonged to something over two years. There would seem to be little question, then, that such measures as snaring, curetting, and cauterization serve to postpone the fatal termination, and also add somewhat to the comfort of the patient. They accomplish, however, nothing more.

Coming now to those cases which have been subjected to radical operations, we find that in Whistler's[8] case, a male aged forty-four, the use of the cold snare and galvano-cautery, six months after the commencement of the disease being followed by recurrence in eight weeks, a radical operation was done eight months later, followed by an almost immediate recurrence, and the death of the patient a short time afterward. In Alsberg's[9] case, a male

[1] Loc. cit. [2] Loc. cit. [3] Loc. cit.
[4] Loc. cit., p. 307. [5] Loc. cit., p. 308. [6] Loc. cit.
[7] Loc. cit. [8] Loc. cit. [9] Loc. cit.

aged forty-three, an external operation was done three months and a half after the commencement of the disease. Death occurred in seven days, from exhaustion. Péan's case, already alluded to, was a male aged sixty-one, who died from cachexia a few months after the operation. No further explanation is given of the cause of death here, but the suggestion naturally occurs that this may have been due to a generalization of the malignant disease. In Küster's[1] case, a male aged sixty-one, with a five-months history, an external operation was done, with the result of death in seven days from pneumonia, and from purulent inflammation of the mediastinum, set up by the passage of the feeding-tube. In a number of instances reported, recurrence has followed the external operation, the secondary development of cancer, however, making its appearance in the neck, rather than in the original seat of the malignant process. Thus, in Lucas' case, a male aged sixty-four, recurrence took place in the neck five months after the external operation, necessitating another operation, which was followed immediately by a secondary recurrence four months later. The same thing occurred in one of Polaillon's[2] cases, a male aged forty-two, in whom the recurrence was observed five months after the operation; while in Fowler's case, a female aged sixty-seven, with a nine-months history of the disease, a recurrence took place in both parotids and the stomach eight months after an external operation. All the cases above alluded to resulted fatally.

In Cheever's first case the history is incomplete, while in his second, a male aged thirty-seven, in whom the disease had existed five and a half months, the tumor was extirpated by means of an external operation with section of the jaw. This was followed by a recurrence and eventual death.

In Burnett's case, a female aged sixty-six, with a history of two years' duration of the disease, the tumor was ligated and excised. There was no recurrence, but the patient succumbed three months later, from exhaustion.

Warren's first case was treated by means of a ligature, which resulted in sloughing of the tumor. His second case was that of a female aged sixty-five, in whom a hard, dense tumor developed in the left tonsil, extending on to the soft palate, giving rise to dysphagia with notable interference with the movements of the lower jaw, to which also it formed attachments. It was excised by means of the knife. The disease seems to have been entirely extirpated, and there was no recurrence up to the time of the death of the patient, eight months later, of peritonitis. Poland[3] believes this

[1] Loc. cit. [2] Cited by Castex.

[3] Brit. and For. Med. Chir. Rev., 1872, vol. i., p. 483.

case to have been one of enchondroma, although, considering the age of the patient and the usual clinical history of enchondroma, Warren's original diagnosis must be considered as correct.

Velpeau operated on one case, a man aged sixty-eight, removing the whole mass through the mouth, first placing a ligature in position about the carotid artery. The operation seems to have been successful, although the patient died eighteen days later, apparently from septicæmia. He makes a passing reference to four other cases which he has seen. These, however, have never been reported.

Bryant saw four cases, none of which were operated on. The first, a male aged sixty-two, succumbed to the disease at the end of nine months. The second presented with a history of a tumor of six weeks' duration, but the disease had progressed so far that it was considered hopeless and was lost sight of. The third was a male aged seventeen, with a six-months history, who succumbed about four months later. The last case, a male aged forty-nine, was somewhat remarkable, in that the disease had apparently existed for two years. This patient was under observation for two months, and when last seen was in a sinking condition.

Demarquay's[1] case was that of a male aged fifty-one, in whom the disease had existed for five months. The tumor was removed by the écraseur. No further report has been made.

We find, therefore, in glancing over these histories, that some of them died as the result of the operation, while the remainder succumbed to recurrence of the disease. If now we compare the average duration of life of those in the group of cases operated upon, with the group of cases detailed above in which no operation was done, the percentage in favor of the operation does not seem to be very great; and yet it must be borne in mind that in many cases the patients survived the operation and were free from the disease for periods varying from three to five months before recurrence set in. Furthermore, a number of instances have been reported in which the operation was successful, and the disease apparently completely eradicated.

Mikulicz's case, a female sixty-five years old, who had suffered for sixteen months with the disease, was subjected to an external operation, and two years and a half later there had been no return. One of Polaillon's cases, a male aged forty-three, with a five-months history of the disease, is reported as cured at the end of twenty-two days, although no further history is given. Of course it is not fair to state that this was a successful case, as the probabilities are that there was a recurrence of the disease subsequently.

[1] Bull. de la Soc. de Chir. de Paris, 1862, 2d series, vol. iii., p. 467.

TREATMENT.—The indications for treatment are thoroughly covered in the brief allusions to the histories of the cases above given. They consist, of course, simply in the complete extirpation of the tumor at the earliest possible period. The important question to be decided upon in this connection is not so much what operation shall be resorted to, as to whether any operation is justifiable. This will depend entirely on the general condition of the patient, the extent of the tumor, and the probability of its successful removal. Of course if the cancerous cachexia has already manifested itself in a notable manner, and the tumor has already extended itself to such neighboring parts as to render its complete extirpation impossible, no operation will be attempted. Where, however, the general condition of the patient warrants it, and the tumor is accessible, there can be no question as to the advisability of removing it. This is of course done not with the full expectation or hope perhaps of accomplishing a successful cure, for all the clinical histories teach us that these growths recur in the very large majority of instances. The promise in the operation lies in the fact that we may secure to our patient not only a prolongation of life, but a period of immunity from suffering varying from one to three months, or even longer, as a study of the cases alluded to which were operated upon clearly shows.

The choice of the operation, whether by means of the wire-snare écraseur, the galvano-cautery, the ligature or lateral pharyngotomy, must be decided by the rules of general surgical procedure and the special indications in each individual case. There can be no question as to the preference which should be given to the use of the wire-snare écraseur, provided the character and contour of the faucial tumor will admit of its use. By this instrument either the whole mass can be extirpated, or it can be removed piecemeal, much assistance being obtained by the local anæsthetic properties of cocaine. I am disposed to think that this will serve a better purpose than the galvano-cautery loop, for I have always entertained the opinion that the use of the galvano-cautery in malignant disease is capable in certain cases of doing injury by stimulating the activity of cell proliferation. The advantage of this device is supposed to lie in the fact that its use is unattended with hemorrhage. This may be true to a certain extent; and yet it seems to me it is a much overestimated claim, as, certainly in my own personal experience in the use of the galvano-cautery, I have found that it requires an exceedingly nice adjustment of the current, to secure exactly that degree of heat which we consider hæmostatic. In fact, I have often seen a troublesome hemorrhage excited by the use of this device. Weiss' case is interesting in this connection

from the fact that, after puncturing the growth with the cautery, a severe hemorrhage followed, which necessitated ligature of the common carotid, from which operation the patient succumbed soon after.

A cold wire loop placed around the neoplasm and drawn home slowly, ordinarily, should secure quite as much immunity from hemorrhage, and even more, I think, than the galvano-cautery. Even in those cases where the disease has extended to the cervical tissues, much can be done in the way of relief of symptoms by clearing away the obstructing neoplasm in the fauces by means of the snare, relieving dysphagia and dyspnœa, even in those cases which are regarded as hopeless.

Various operations have been resorted to for gaining access to the tumor by means of external incisions, most of which constitute really capital operations. In Péan's case the growth was reached simply by an incision from the angle of the mouth to the anterior border of the masseter muscle; while Küster extended this same incision across the angle of the jaw to the border of the sterno-mastoid muscle, and also cut through the ascending ramus, disarticulating the upper fragment and removing it entirely.

Polaillon carried the same incision back until it met the ordinary vertical incision which he made for tying the carotid artery, and, instead of disarticulating, simply excised a portion of the inferior maxilla.

Cheever, in his second case, made the same incision through the integument and ramus of the jaw practically as Küster, but, instead of disarticulating the upper fragment, simply separated the two portions of the jaw.

Mikulicz obtained access to the neoplasm by a linear incision from the mastoid to the hyoid bone, and subsequently excised the ascending ramus of the inferior maxilla subperiosteally.

These operations will be more fully described in the chapter devoted to the external surgery of the pharynx. The question of preliminary tracheotomy, which in many of the procedures was considered necessary, is one to be determined by the symptoms and conditions which present in each individual case.

Carcinoma of the Pharynx.

It would seem that few regions of the body are more exempt from the invasion of carcinoma than the lower pharynx. Thus, Winniwarter[1] found no single instance of malignant disease of this region in a collation of 548 cases of all forms of cancer in all por-

[1] "Beiträge zur Statistik der Carcinome," Stuttgart, 1878, p. 4.

tions of the body; while Langenbeck[1] reports that of 230 cases of cancer observed in his own clinic, from 1850 to 1856, the pharynx was involved in but one instance.

An investigation of the current literature of later years, however, would seem to suggest that perhaps this form of malignant disease is more frequent than was formerly supposed. Thus, Iversen[2] reports five cases as having come under his personal observation; while Langenbeck[3] reports having subsequently seen four cases in a single year.

The first of these was a male aged 48, who presented with the history of a tumor in the pharynx, which had been present for eight months, giving rise to dysphagia and dyspnœa. The glands of the neck were involved, and the tumor of the pharynx extensively ulcerated. The tumor commenced in the pharyngeal wall, and subsequently extended to the larynx. Resection of the pharynx with extirpation of the larynx was done, and the patient died three days later of pneumonia. A second case occurred, in a male aged 78, who presented with the history of a tumor existing for three and a half months, giving rise to glandular enlargement, with notable dysphagia. In this case the disease extended down into the œsophagus. Lateral pharyngotomy was done, and the patient died in collapse. His third case occurred in a female aged 52. In this instance also the disease extended downward to the larynx, giving rise to dysphagia and dyspnœa. The pharynx was extirpated and the larynx resected. The patient died from pneumonia thirteen days later. His other case is not reported.

Iversen[4] reports five cases: The first case was a female aged 34, in whom the disease had existed six months, and had invaded the œsophagus. Subhyoid pharyngotomy was done, and the growth removed by means of the scissors. The disease recurred, and the patient died six months later. His second case was that of a female aged 51, in whom the disease commenced in the pharynx, and subsequently invaded the larynx, giving rise to dysphagia and dyspnœa. Subhyoid pharyngotomy was done, followed by recurrence at the end of six months, and the death of the patient five months later, the total duration of the disease being seventeen months. His third case occurred in a female aged 44, in which the extension was downward to the œsophagus. Resection of the pharynx and extirpation of the larynx was done in this case, and at the end of eleven months the patient was entirely well, there having been no recurrence at this date. A fourth case was that of a female aged 48, in whom the disease had been present for six months, and had also extended downward to the œsophagus. Subhyoid pharyngotomy with resection of the pharynx was done here, followed by recurrence and death of the patient five months later, the total duration of the disease in this case being eleven months. His last case was that of a female aged 48, in whom the disease had existed for six months, extending to the œsophagus and also to the larynx. Resection of the pharynx, a portion of the œsophagus, and extirpation of the larynx were performed in this case. There was no recurrence five months later.

Habershon[5] saw a case in a female aged 32, in whom the disease, com-

[1] Arch. für klin. Chir., 1879, vol. xxiv., p. 825.
[2] Arch. für klin. Chir., 1885, vol. xxxi., p. 610.
[3] Loc. cit. [4] Loc. cit.
[5] Guy's Hospital Reports, 1856, 3d series, vol. ii., p. 225.

mencing low down in the pharynx, seems to have extended upward somewhat, giving rise to notable dysphagia. No operation was done, and the patient died from exhaustion a year after the commencement of the attack.

Shaw [1] reports a case occurring in a male aged 44, in whom the disease had existed for six months, extending downward to the larynx, giving rise to dysphagia and dyspnœa. No operation was done, and the patient died from exhaustion.

Luigi [2] reports a case occurring in a female aged 30, in whom the disease, commencing in the pharynx, extended down to the œsophagus, resulting in death at the end of eighteen months, no operation having been done.

Simon [3] observed a case occurring in a female, in whom the disease commenced in the upper portion of the pharynx behind the uvula, and extended upward. The prominent symptom here seems to have been attacks of hemorrhage, with some dysphagia. The palate was split and the tumor scraped out. This was followed by an early recurrence.

Küster [4] reports a case of cancer of the pharynx occurring in a female, whose age is not given. The disease also involved the œsophagus. Subhyoid pharyngotomy was done, and the patient died shortly after, of inflammation of the mediastinum. In a second case of Küster's, of which no full particulars are given, other than that it was operated on in the same manner, death occurred from collapse.

Hunter Mackenzie [5] also reports a case, occurring in a female aged 45, in whom the disease, making its appearance in the pharynx, extended downward toward the œsophagus. There was dysphagia, with regurgitation of food and frequent hemorrhages, the surface of the tumor being ulcerated. Palliative treatment only was resorted to in this case, by means of the galvano-cautery. The ultimate result is not given.

Studsgaard [6] reports a case which occurred in a female aged 41, in whom the disease had been present for a year, and extended down toward the œsophagus. Subhyoid pharyngotomy was done, and the tumor scraped out by means of the spoon. There was an early recurrence, and the patient succumbed eight months later, the total duration of the disease being twenty months.

E. Frankel [7] reports having observed three cases of cancer of the pharynx. Two of them, however, seem to have had their primary origin in the posterior wall of the larynx and do not properly belong to this category. His third case was that of a female aged 40, in which the disease, starting primarily in the pharynx, subsequently extended to the larynx, giving rise to a fistulous opening in this organ. No operation was done, and the patient died six months after the commencement of the disease.

In addition to the above, Koenig [8] reports having observed two cases of cancer of the pharynx, although no details are given.

Under the title of "Recurrent Papilloma of the Pharynx," Roe [9] reports a case of a woman aged 61, who had suffered for a year from the presence of a

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[1] Trans. Path. Soc. London, 1857, vol. viii., p. 172.

[2] Bul. delle Scienze med. di Bol., Bologna, 1869, 5th series, vol. vii., p. 143.

[3] "Beiträge zür Geburtshülfe und Gynäkologie," 1872, vol. i., p. 21.

[4] Berl. klin. Woch., 1883, No. 44.

[5] Edinburgh Med. Jour., 1884–85, vol. xxx., p. 399.

[6] Cited by Iversen: Loc. cit.

[7] Deutsche med. Woch., 1889, vol. xv., p. 779.

[8] Deutsche Chir., Lieferung 35, p. 67.

[9] "Illus. Medicine and Surgery," 1882, vols. i. and ii., p. 69.

neoplasm in the pharynx, which when seen presented a roughened, slightly lobular appearance, and completely filled the oro-pharynx. It was removed with the galvano-cautery and recurred three weeks later, when it was again removed and freely cauterized, and for a time seemed to be under control, though finally it reappeared in the lower portion of the pharynx and eventually in the œsophagus. No further report is given, although we are left to infer that the patient subsequently succumbed. The clinical history of this case would seem to suggest that it was probably one of epithelioma.

Desgrange [1] reports the case of a female, who for a year had suffered with some difficulty in respiration, the cause of which was found to be an irregularly mammillated and ulcerated growth situated upon the posterior pharyngeal wall, which had spread also to the lateral walls, converting the pharynx into a narrow canal, as it were, which rendered respiration and deglutition extremely difficult. The cervical glands were enlarged, and palpation externally revealed, besides these, the deeper growth already described in the pharynx. No further account of the case is given, but from the involvement we may suppose that death was the ultimate result.

Marcacci [2] cites the instance of a female aged 20, who suffered from a stratified epithelioma involving the lower pharynx and the upper part of the œsophagus. The larynx was also involved. Subhyoid pharyngotomy was done, but the patient succumbed four days after the operation.

Sick [3] reports the case of a male aged 64, who had suffered for a year and a half from pain on swallowing, and a feeling of a foreign body in the throat. There was also slight hemorrhage. An examination revealed an ulcerated growth involving the right side of the pharynx, and extending to the larynx and base of the tongue. Tracheotomy was done, and the patient succumbed a short time after from pyæmia. An autopsy revealed secondary deposits in the lungs, liver, and in the common facial vein. The internal jugular and the superior thyroid veins also contained thrombi of malignant material. The growth was a medullary carcinoma.

Romberg [4] reports the case of a male aged 45, who suffered for six months with difficulty in deglutition and pain in the throat. This was so severe during the last few weeks that life was supported by nutrient enemata. An examination through the mouth simply showed considerable injection of the mucous membrane, but a sound was arrested at the cricoid cartilage. The patient died of inanition, no operative interference being attempted, and a post-mortem examination revealed a carcinoma of the posterior pharyngeal wall extending from the level of the thyroid cartilage, and also involving the anterior wall of the pharynx, causing a ring-like structure of this part. The growth did not extend to the œsophagus. There were no metastatic deposits.

Voltolini [5] reports a case in a female aged 43, in whom a growth in the larynx, which proved to be a medullary cancer, had existed for a year, giving rise to dysphagia and some dyspnœa. Palliative measures only were resorted to, and the patient died soon afterward. This was reported as a carcinoma of the entrance of the œsophagus, but the history would seem to indicate that its primary origin was in the ary-epiglottic fold of the larynx, and that the disease subsequently extended to the posterior pharyngeal wall.

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[1] Leçons de clin. Chir., Paris, 1868, fasc. ii., p. 125.

[2] Gior. internaz. delle Scienze med., 1880, n. s., vol. ii., p. 981.

[3] Constatts Jahresber., 1865, vol. iv., p. 234.

[4] Woch. für die gesammte Heilkunde, 1833, vol. i., p. 40.

[5] Virchow's Arch., vol. xlv., p. 513.

In a case reported by Peabody,[1] also, as a carcinoma of the pharynx, a careful reading of the report warrants the belief that the larynx was the primary seat of the disease.

In the same manner I think we must reject the case reported by Poland.[2]

B. Frankel[3] reports a case of carcinoma commencing in the pharynx, which extended to the larynx, resulting in necrosis of the thyroid cartilage, with the formation of a laryngeal fistula. No operation was done, and the patient died of pneumonia five months after the commencement of the disease.

In a case reported by Gray, of a female aged 44, the disease spread rapidly into the œsophagus, and resulted in death from inanition at the end of four and a half months.

A case reported by Guelliot, of a male aged 57, is interesting from the fact that, death occurring at the end of six months, an autopsy showed carcinomatous deposits in the liver and unusually large masses of infiltrated glands on both sides of the neck.

A case reported by Mayor[6] is notable from the fact that the patient, a male aged 60, died from inanition twelve months after the commencement of the disease, when an autopsy showed a comparatively small epitheliomatous growth in the lateral wall of the pharynx, which had subsequently extended to the larynx; whereas there had existed for a considerable period an exceedingly large carcinomatous infiltration of the cervical glands. In this case also cancerous deposits were found in the liver as well as the lungs and abdominal glands.

Küster also reports two cases in which the data are insufficient to base any conclusions upon. The same also can be said of an instance cited by Von Bergmann, while in a case reported by Holmes a careful study of the report seems to clearly indicate that the growth was really an œsophageal cancer.

ETIOLOGY.—In some of these cases there seems to have been a history of local inflammatory disorders in the pharynx, existing some time before the development of the malignant disease. That this had any influence in the subsequent changes can scarcely be supposed.

Curiously enough, we find that the large majority of cases occur in females. Of those cases in which the sex is reported, seventeen were females, while but seven were males.

It is somewhat interesting to note the early period of life in which malignant disease of the pharynx develops. In the fourth decade of life, between thirty and forty, there were three cases reported; in the fifth decade, ten cases; in the sixth and seventh decade, three cases in each; while in the eighth decade but one is reported.

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[1] New York Med. Record, vol. xxi., p. 551.

[2] Guy's Hospital Reports, 1851, vol. vii., p. 317.

[3] Berl. klin. Woch., 1877, vol. xiv., p. 10.

[4] Trans. Path. Soc. London, 1854–55, vol. vi., p. 183.

[5] Bull. de la Soc. anat., Paris, 1880, vol. lv., p. 266.

[6] Bull. de la Soc. anat., Paris, 1878, vol. liii., pp. 438 and 467. Progrès méd., 1879, vol. vii., pp. 166 and 245.

In some of the cases, there was the usual history of heredity, which, however, adds nothing new to our knowledge of the disease.

It is interesting, in this connection, to compare malignant disease of the pharnyx with that of the œsophagus, wherein we find, according to Morell Mackenzie,[1] that, out of 231 cases, 58 occurred between forty and fifty, 80 between fifty and sixty, and 53 between sixty and seventy, thus showing that the pharyngeal disease apparently belongs to a much earlier period than the œsophageal. As regards sex, the difference is also very striking, in that Mackenzie also shows that, of 247 cases of œsophageal cancer collated, 188 occurred in males, while but 59 were observed in females. This comparison is made as bringing out a somewhat curious fact without, of course, attempting to make any explanatory suggestion.

PATHOLOGY.—The prevailing type of carcinoma which is observed in the pharynx is epithelioma. In none of the cases above reported has any other form of disease been specified, although in some instances the neoplasm was reported simply as cancer.

Its development would seem to follow the ordinary course of this form of malignant disease when met with in the fauces, viz., to develop somewhat rapidly into ulceration, with the usual concomitants of that complication, viz., mild hemorrhagic attacks or bloody discharges.

As regards extension, in most instances this seems to have been downward, although in Simon's and Habershon's cases the reverse was true, the disease commencing in the upper portion of the lower pharynx and extending upward toward the pharyngeal vault. The pharynx belonging essentially, from an anatomical point of view, to the food tract, we should naturally expect any extension of malignant disease in this region to invade the œsophagus. This is reported to have occurred in ten of the cases given above, while in six cases the larynx was invaded. In one instance both the larynx and œsophagus were invaded.

With the exception of the cases reported by Guelliot, Sick, and Mayor, there seems to have been no tendency to generalization of the disease as far as an invasion of other organs is concerned, although the cervical glands in most instances seem to have been involved. It is somewhat curious that, of Iversen's five cases, in four it is specifically stated that the cervical glands were not enlarged, while in all other reported cases where this symptom is referred to, the glands about the cervical region or the angle of the jaw were enlarged or infiltrated.

We thus find that, while secondary enlargement of the cervical glands is an almost constant attendant of the disease, it does not

[1] "Diseases of the Nose and Throat," Phil., 1879, vol. ii., pp. 86, 87.

seem to have played any very important part as complicating the primary neoplasm. Guelliot's and Mayor's cases, however, were exceptions, in that the external tumor seems to have been the prominent feature of the case, and the pharyngeal disease in both these cases was only found upon an autopsy.

SYMPTOMATOLOGY.—In most of these cases the earliest symptoms of the disease seem to have been insidious, the tumor commencing in one or the other lateral wall of the pharynx, and, growing by somewhat slow progress, gave rise to but slight interference with the functions of the parts, especially with reference to deglutition. In no case, so far as I know, was pain or hemorrhage a symptom of the earlier development of the disease. After the tumor has been present for some months, however, it seems to be the usual history, in many cases certainly, that it should take on a somewhat rapid growth, increasing in size while at the same time new symptoms are developed with reference to mechanical interference with function, as well as pain and secretion. The tumor developing in size, of course, more markedly hampers the function of deglutition, this being rendered exceedingly difficult or impossible for solids. The neoplasm extends now not only by projecting forward, but laterally, in such a way that the flexibility of the pharyngeal walls is destroyed, hence the impairment of deglutition is not purely due to the mechanical obstruction of the tumor, but to the fact that the muscular tissues of the pharynx are practically destroyed.

If the tumor extend upward, as occurred in a few instances, the symptoms are mainly confined to those with reference to deglutition and impairment of voice, while in the latter stages ulceration takes place, with its attendant secretion and attacks of hemorrhage. In no case reported has serious hemorrhage taken place from ulceration and destruction of arterial coats, such as we have seen to be the case in cancer of the tonsil; but the hemorrhage consists simply in oozing apparently from the ulcerated surface.

Where the disease extends downward it seems to attack indifferently the larynx, the œsophagus, or both. Where the former occurs, the additional symptoms of dyspnœa, with impairment or loss of voice, and cough, are added.

From a practical point of view, as long as the malignant disease confines itself to the pharynx the symptoms are, mainly, interference with function, hypersecretion, and, in the later stages, pain with slight hemorrhages. Curiously enough, however, even in advanced cases pain referable to the region does not seem to have been a very constant symptom when the parts are at rest, although this is present to a more or less distressing extent in the attempt

at deglutition, which, especially after ulceration has taken place, becomes quite painful.

As we should naturally suppose, we find the peculiar cancerous cachexia manifesting itself quite early in the history of these cases. This, of course, is easily understood from the fact that the disease, locating itself in such a region as to interfere with the nourishment of the body, naturally results very soon in the development of a condition of malnutrition.

DIAGNOSIS.—In the earlier stages of the disease, before the tumor has assumed decided proportions, it would seem that a diagnosis would be exceedingly difficult. Hunter Mackenzie,[1] however, lays a special emphasis on the fact that a localized area of inflammation in the pharynx in adult life, together with regurgitation of food, ought to excite a suspicion of malignant disease. A local inflammatory area, perhaps, may possess a diagnostic significance, but the regurgitation of food, I think, would scarcely be present until there was notable stricture of the lower pharynx or œsophagus, namely, in the advanced stage of the disease.

As the neoplasm enlarges, it presents to ocular inspection the ordinary appearances of an epitheliomatous growth, namely, a broad, somewhat flattened, infiltrated placque of mucous membrane, of a whitish-gray color, with perhaps a suggestion of pink, and a notable inflammatory area of redness around it—this latter appearance being one of no little diagnostic value. On palpation, the mass presents to the touch the peculiar and characteristic hardness of carcinomatous infiltration, with a smooth, unbroken surface; although in Gray's case the surface of the tumor is reported as having been of a villous character.

The next stage of the disease consists in the development of ulceration, which, as we know, is liable to occur quite early in the history of the disease. An epitheliomatous ulcer presents appearances which are not easily mistaken. The whole mass projects above the surface of the mucous membrane, while its central portion is usually depressed. It is ragged, of a yellowish-gray dirty color, and covered with a somewhat scanty, slightly opaque serum ordinarily tinged with blood, whose source is in the eroded capillaries.

There is always something in a malignant disease which it is more easy to recognize than to describe, and which tells us, perhaps by a sort of diagnostic instinct, that the disease under inspection is cancer. The further diagnostic points are dependent upon the symptoms, the early development of glandular enlargement, and finally on the removal of a small portion for examination under the microscope. Although perhaps this measure is not abso-

[1] Loc. cit.

lutely necessary, no diagnosis can be considered as fully established at the present day without it.

Notwithstading Iversen's cases, I am disposed to think that secondary enlargement of the cervical glands must be considered as an almost constant and early symptom of malignant disease of the pharynx. Furthermore, I think that, when we consider Guelliot's and Mayor's cases, it becomes our duty to search carefully the pharyngeal and laryngeal cavities in every instance of notable enlargement of the cervical glands which carries with it the slightest suspicion of malignancy.

PROGNOSIS.—The pharynx must be regarded as a region in which malignant disease shows exceedingly fatal tendencies. This can be explained, in part certainly, by the fact that a cancerous neoplasm here encroaches very early upon the food tract, and in many cases upon the air tract. The result of this is that the general health becomes notably impaired somewhat early in the history of the disease. The exceeding gravity and fatality of the disease, I think, is very clearly indicated by the cases reported above: thus, of fifteen in which the histories are sufficiently complete as to afford definite data, the average duration of life from the commencement of the disease until death occurred was but nine and a half months. The longest time which any patient survived was in the case of Studsgaard, death not occurring until the expiration of about twenty months, while in the majority of instances the patients lived but from three to eight months after the disease had set in. Of these fifteen cases, however, seven were operated on, while eight were not. Of the latter, the average duration of life was eight and a half months, while the average duration of life in the cases operated upon was ten and a quarter months; which would seem to indicate that the operation had really served the purpose of prolonging life, although these cases all died.

In addition to the above fifteen fatal cases, we find among Iversen's reports one in which there was no recurrence eleven months after a resection of the pharynx and extirpation of the larynx, and one in which there was no recurrence five months after a resection of the pharynx, œsophagus, and larynx. These cases need no comment, as their teaching is quite clear. We can scarcely accept them as cases of cancer cured, when the report only extends to five months after operation in the one case, and eleven months in the other, and yet the preservation of life for these periods of time, by the radical surgery which Iversen practised, shows us beyond question that the only hope of eradicating the disease, or even prolonging life, lies in the thorough removal of every portion of diseased tissue.

TREATMENT.—The indications for treatment have already been shown with sufficient clearness in the discussion of the other features of carcinoma of the pharynx; hence, no suggestions further than the teachings of the cases alluded to above need be made.

Mere palliative measures were resorted to in quite a number of cases reported; and that these were successful in prolonging life to a certain extent cannot, I think, be questioned. If the tumor confines itself entirely to the pharynx and offers a mechanical obstacle to deglutition, the removal of portions of the growth, whereby this function is in part re-established, certainly adds to the patient's comfort. That any operation through the natural passages is other than a palliative measure is clearly shown. The suggestion, therefore, is simply that where a radical operation is hopeless it becomes our imperative duty to add as much as possible to the comfort of the patient by the palliative measures of treatment. Any definite suggestions here, of course, cannot be made; each operator will be governed entirely by the special features of each individual case. I am disposed to think, however, that the removal of the masses by the cold snare is better than by the galvano-cautery loop. The use of the spoon, curette, or scissors belongs, I think, to earlier days of surgery, and would scarcely be resorted to at the present time. In Iversen's successful cases, he performed subhyoidean pharyngotomy as a preliminary operation. After this he was enabled to determine the extent of the growth, and based his subsequent procedures largely on what he discovered. In each case, as will have been noticed, he proceeded until he had removed the tissue which had been invaded by the cancerous disease. His results must be considered a somewhat remarkable success, in view of which I think there can be little question as to the advisability of this thorough and radical method of procedure, providing the general condition of the patient is such as to warrant it.

Section II.

Diseases of the Larynx.

DISEASES OF THE LARYNX.

CHAPTER XXV.

THE ANATOMY OF THE LARYNX.

THE cartilaginous framework which with its contents constitutes the larynx is superimposed upon the tracheal rings, and practically consists of such a modification of these rings as fits it for the performance of its special function, namely, that of phonation. At the same time, the phonatory apparatus is so arranged that the larynx shall constitute a free and unimpeded channel for the current of air in inspiration and expiration.

CARTILAGES.—The frame of the larynx (see Fig. 34) is composed of five principal cartilages, namely, the thyroid, the cricoid, the epiglottis, and the two arytenoids. In addition to these, we find two small supplementary cartilages on each side, those of Santorini and those of Wrisberg.

The Cricoid (see Figs. 35, 36).—The cricoid is the foundation cartilage of the larynx, in that all the other portions rest upon it. It is practically the upper ring of the trachea, but so modified, thickened, and enlarged as to afford a support to the other laryngeal cartilages, and attachment for muscles. In shape, it bears a close resemblance to a seal ring, from which it derives its name. Its anterior half is small, rounded, and convex, and affords attachment to the crico-thyroid muscles. The posterior half is the broad, expanded portion, corresponding to the seal of the ring. The upper surface of this portion is marked by two facets, for articulation with the arytenoid cartilages, the long diameter of these facets lying transversely. On the outer portion of this half of the cartilage are found two small depressions, which mark the points of articulation with the inferior cornua of the thyroid cartilage.

The under surface of the cricoid is attached to the upper ring of the trachea. Its upper surface in front affords attachment to the crico-thyroid membrane, and at the sides to the lateral crico-arytenoid muscles or glottis-closers. The posterior surface of the

expanded portion of the cartilage presents a ridge in the median line, which affords attachment to the fibrous tissue of the œsophagus, while on either side of this ridge there are shallow depressions, into which are inserted the fibres of the posterior crico-arytenoid muscles or glottis-openers.

The Thyroid (see Figs. 37, 38). —The thyroid cartilage consists of two broad, flat, quadrilateral plates, as it were, united anteriorly at a somewhat sharp angle, thus constituting a broad protruding shield, which forms a large portion of the anterior and

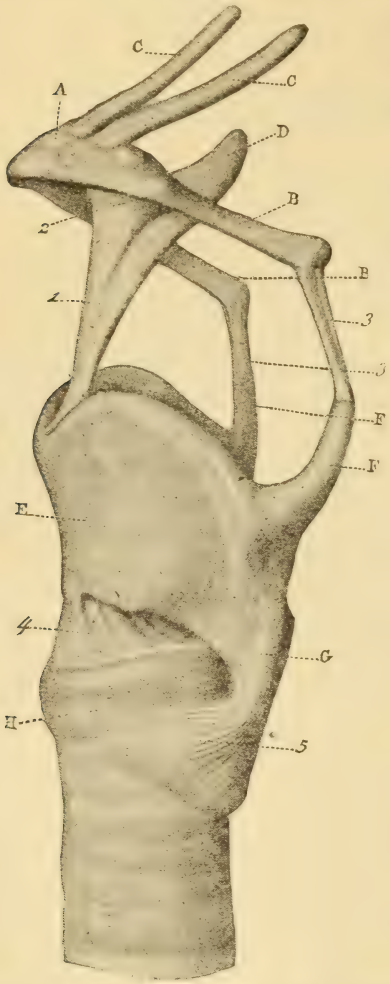

FIG. 34.—The Cartilaginous Frame of the Larynx, with the Hyoid Bone and Ligamentous Attachments (Broca). A, Hyoid bone; B, B, the greater cornua of the hyoid; C, C, the lesser cornua of the hyoid; D, epiglottis; E, thyroid cartilage; F, F, the superior cornua of the thyroid; G, the lesser cornu of the thyroid; H, cricoid cartilage; 1, thyro-epiglottic ligament; 2, hyo-epiglottic ligament; 3, lateral thyro-hyoid ligament; 4, median crico-thyroid ligament; 5, lateral crico-thyroid ligament.

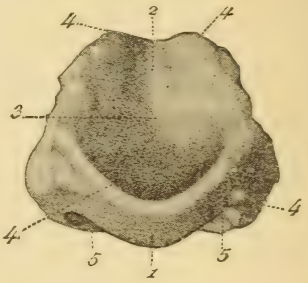

FIG. 35.—The Cricoid, seen Anteriorly (Broca). 1, Anterior portion; 2, posterior portion; 3, internal surface; 4, superior circumference; 5, inferior border.

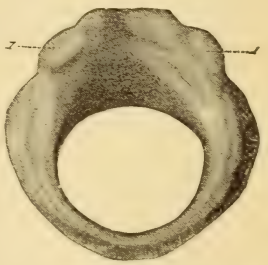

FIG. 36.—The Cricoid, Upper Surface. 1, 1, Articular facets for the arytenoid cartilages.

lateral walls of the larynx, and thus affords ample protection from external violence. The junction of the two broad plates or wings which form this cartilage is marked anteriorly and above by a deep sulcus or notch, the thyroid notch. The posterior border of each ala

is marked by two prolongations above and below, the superior and inferior horns or cornua. The upper cornua afford attachment to the thyro-hyoid ligament, while the inferior cornua articulate with the cricoid cartilage, thus forming the only articular junction between the two cartilages, although the attachment is completed by means of the crico-thyroid ligament and the crico-thyroid muscles.

At the receding angle of the thyroid cartilage internally, we find attachments, in the median line above, to the ligament of the epiglottis, while immediately below this, on either side of the median line, are the attachments of the ventricular bands, and below these that of the vocal cords. Immediately without the point of attach-

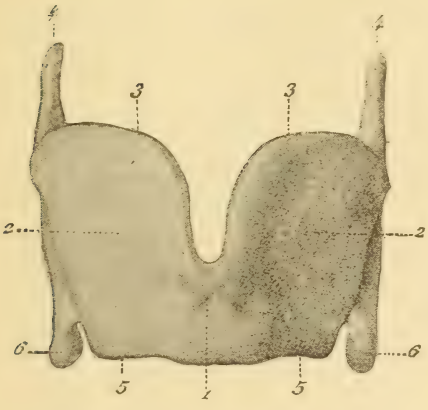

FIG. 37.—The Thyroid, Anterior Aspect (Broca). 1, Pomum Adami; 2, 2, quadrilateral surface of each ala; 3, 3, superior border; 4, 4, superior cornua; 5, 5, inferior border; 6, 6, inferior cornua.

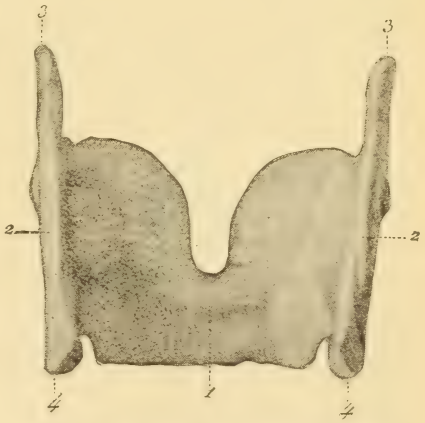

FIG. 38.—The Thyroid, Posterior Aspect (Broca). 1, Receding angle; 2, 2, posterior borders; 3, 3, superior cornua; 4, 4, inferior cornua.

ment of the vocal cords are the points of insertion of the thyro-arytenoid muscles. The posterior border of each ala affords attachment to the stylo-pharyngeus muscle, while immediately in front of these, and on the outer surface, are found successively the attachments of the inferior constrictor, the sterno-thyroid, and thyro-hyoid muscles; while on the lower portion of the outer face of each ring, is found the attachment of the crico-thyroid muscle.

The Arytenoids (see Figs. 39, 40).—The arytenoid cartilages are so named from their resemblance to the mouth of a pitcher. They are small, three-sided pyramids, resting by their bases upon the upper surface of the posterior portion of the cricoid ring. The cartilages are so situated that the internal faces of each are nearly parallel. The anterior angle of each is prolonged, and receives the attachment of the vocal cord, while into the external angle of

the base of each is inserted both the posterior and lateral crico-arytenoid muscles. The base of each cartilage presents a broad, oval depression, for articulation with the facet already described on the superior margin of the posterior portion of the cricoid cartilage. This depression is much larger than the facet, with which it articulates, thus allowing great freedom of motion.

The apex of each of these cartilages is pointed, and bent slightly inward and backward.

The Cartilages of Santorini (see Figs. 39, 40).—In the mucous membrane immediately over the apex of each arytenoid cartilage are found ordinarily two small fibro-cartilaginous nodules, called the cornicula laryngis or cartilages of Santorini, which are of interest mainly from an anatomical point of view.

The Cartilages of Wrisberg.—In each fold of mucous membrane which stretches from the arytenoid cartilages to the sides of the

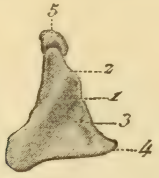

FIG. 39.

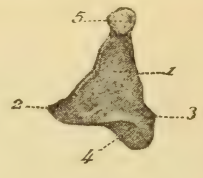

FIG. 40.

FIG. 39.—Anterior Face of the Arytenoid (Broca). 1, 2, 3, Facets for the insertion of the ventricular band; 4, antero-internal angle of base or of vocal process; 5, caput Santorini.

FIG. 40.—Posterior Face of the Arytenoid (Broca). 1, Facet for the insertion of the ventricular band; 2, antero-internal angle of the base, the point of insertion of the vocal cord; 3, point of insertion of the posterior and lateral crico-arytenoid muscles; 4, facet for articulation with the cricoid; 5, caput Santorini.

epiglottis, namely, the ary-epiglottic fold, at about one-third the distance from the arytenoids, there is found a slender, staff-like fibro-cartilage, the staff of Wrisberg, which is recognizable by a slight projection in the fold, immediately in front of the caput Santorini. This cartilage also seems to possess no special function in the human economy, though, according to Sutton,[1] both the cartilages of Santorini and Wrisberg are rudimentary structures, which represent cartilaginous prolongations, in the lower animals, from the epiglottis to the arytenoids.

The Epiglottis.—This is a thin plate of fibro-cartilage, shaped somewhat like a leaf, rounded above, and terminating below in a somewhat elongated pedicle, called the petiolus, which is attached to the receding angle of the thyroid cartilage, immediately below the notch, by means of a ligamentous band, the thyro-epiglottic ligament, in such a way as to allow the largest freedom of antero-lateral movement. Its anterior surface is convex from side to side, and concave from above downward, its superior border, as a rule,

[1] Journal of Anatomy, London, 1889.

being curved forward over the base of the tongue, to which it is attached at its lower part in the median line by a band of fibrous tissue, the glosso-epiglottic ligament; while laterally, the mucous membrane is thrown into two smaller folds, usually called the lateral glosso-epiglottic ligaments; although, according to Collier,[1] no ligamentous tissue is found in these folds. The lingual face of this cartilage is studded with a number of minute depressions, which mark the site of the muciparous glands. The ary-epiglottic folds are attached to the sides of the cartilage.

During the act of deglutition, the larynx is drawn up beneath the base of the tongue, in such a manner that the epiglottis is drawn over the opening of the larynx, something after the manner of a trap-door, thus preventing the entrance of food into the air passages. It was formerly supposed that this trap-door function of the epiglottis was indispensable. Clinical experience teaches us, however, that the constrictors of the larynx exclude food from the air passages, even when the epiglottis is entirely destroyed by disease.

In addition to the above cartilages, Luschka[2] has discovered in the larynx several small cartilaginous structures which, although not invariably present, possess a certain amount of interest. These are the posterior sesamoid cartilages, small oblong masses between the arytenoids and the cartilages of Santorini, to which they are attached by delicate bands of ligamentary tissue; and the anterior sesamoid cartilages, located in the anterior portion of the vocal cords, where they are inserted into the receding angle of the thyroid. They are very minute in size, and separated from the thyroid cartilage by a layer of dense fibrous tissue. The inter-arytenoid cartilage is a small cartilaginous mass found, very rarely, between the arytenoids.

Gruber[3] reports an instance of the abnormal development of the median ridge on the upper surface of the body of the cricoid, projecting between the arytenoid cartilages.

LIGAMENTS (see Fig. 34).—Outside of the larynx, we find the thyroid cartilage connected with the hyoid bone by means of the thyro-hyoid membrane and the two lateral thyro-hyoid ligaments.

The thyro-hyoid membrane is a broad layer of fibro-elastic tissue, which extends from the upper border of the thyroid cartilage to the upper border of the hyoid bone, being separated from the inner surface of the latter by a synovial bursa. It is pierced in the median line by the superior laryngeal vessels and nerve.

The lateral thyro-hyoid ligaments are rounded, cord-like bundles of

[1] Journal of Laryngology, 1888, vol. ii., p. 223.

[2] "Der Kehlkopf des Menschen," Tübingen, 1871.

[3] Arch. für anat.-phys. und wissenschaft. Med., 1874, p. 454.

fibro-elastic tissue, which extend from the superior cornua of the thyroid cartilage to the greater cornua of the hyoid bone. Gruber[1] reports an instance in which the greater cornu of the hyoid of the right side was bent downward, in such a manner as to impinge upon and articulate with a supernumerary tubercle on the upper border of the thyroid. A still further ligamentous connection between the hyoid bone and the larynx is found in *the hyo-epiglottic ligament*, a band of fibro-elastic tissue, which arises from near the apex of the epiglottis, and is inserted into the posterior surface of the body of the hyoid. The laryngeal cartilages themselves are bound together by a series of ligaments, which are usually spoken of as internal or intrinsic ligaments. The thyroid cartilage is connected with the cricoid by means of three ligaments, the crico-thyroid membrane and the capsular ligaments.

The crico-thyroid membrane is a thick, elastic membrane which fills in the gap left between the upper border of the cricoid and the lower border of the anterior portion of the thyroid cartilage. Laterally it becomes blended with the anterior insertion of the true vocal cords. In the median line, it lies directly beneath the skin, while laterally it is covered by the crico-thyroid muscles. It is crossed horizontally by a small arterial branch, forming an anastomosis between the crico-thyroid arteries of either side. On its inner surface, the central portion is simply covered by the mucous membrane, while laterally it is covered by the thyro-arytenoid and lateral crico-arytenoid muscles. The connection between the thyroid and cricoid cartilages is completed by the articulation of the inferior cornua of the thyroid with the sides of the cricoid. This is enclosed by a capsular ligament, within which is found a synovial membrane. Gruber[2] reports having observed, in a single instance, a still further connection between these two cartilages, in an abnormally developed anterior cornu, which, springing from the lower border of each wing of the thyroid cartilage anteriorly, articulated with a supernumerary facet on the cricoid, this articulation being enclosed also in a capsular ligament.

Each crico-arytenoid joint is re-enforced by loose capsular ligaments, within which are synovial membranes. Posteriorly, however, the capsule is strengthened by a *posterior crico-arytenoid ligament.*

The epiglottis is connected with the receding angle of the thyroid cartilage by means of *the thyro-epiglottic ligament*, a long, rounded, flexible bundle of fibro-elastic tissue. The epiglottis is also attached to the base of the tongue by *the median glosso-epiglottic ligament* and by two lateral folds, which, as we have seen,

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[1] Op. cit., 1876, p. 753.

[2] Op. cit., 1874, p. 454.

contain no ligamentous tissue other than the continuation of the pharyngeal aponeurosis.

THE CAVITY OF THE LARYNX (see Fig. 41).—In examining the laryngeal cavity, commencing from above downward, we first come upon the crest of the epiglottis, lying in the median line at

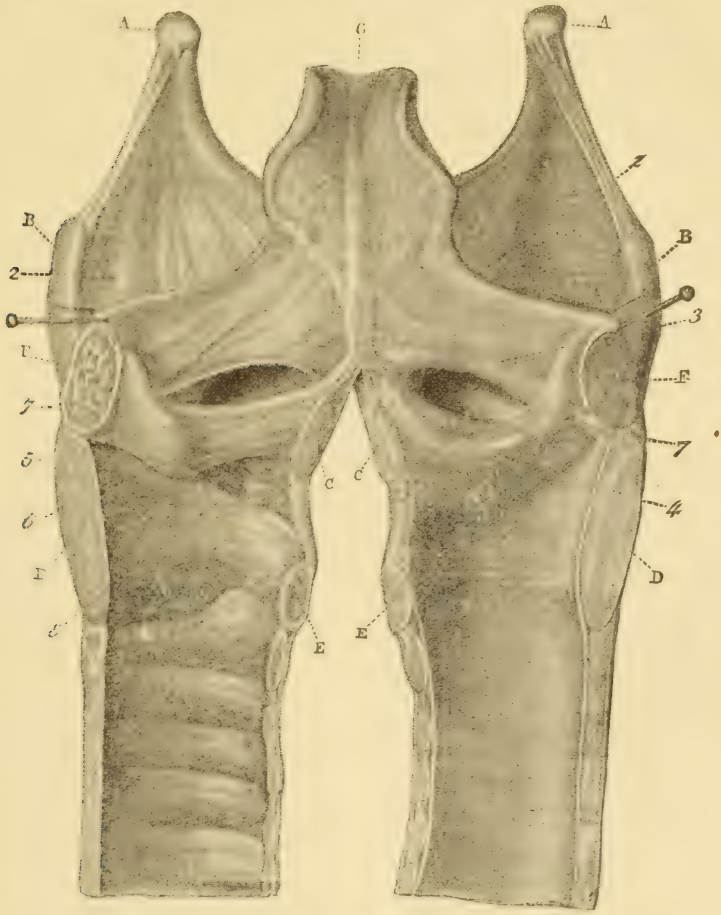

FIG. 41.—Antero-Posterior Section of Larynx, showing the Cavity after the Removal of the Mucous Membrane from left lateral half (Broca). A, A, Hyoid bone; B, B, greater cornua of thyroid; C, C, section of thyroid at commissure; D, D, cricoid cartilage divided posteriorly; E, E, anterior section of cricoid; F, F, arytenoideus muscle divided; G, posterior surface of epiglottis; 1, ary-epiglottic fold; 2, muscular fibres in the fold; 3, ventricular band; 4, true cord; 5, ligamentous portion of same; 6, thyro-arytenoid muscle; 7, ventricle; 8, internal surface of the crico-thyroid muscle.

the base of the tongue. This presents a more or less crescentic shape, but varies within the limits of normality in a very marked degree. The crest may present as the arc of a comparatively large circle, or it may be bent on itself to such an extent as to present the outline almost of a shepherd's crook, this latter condi-

tion being more characteristic of early life. As a rule, of course, the centre of the epiglottis is in alignment with the median line of the body, although not infrequently we meet with a considerable deviation to one side, without constituting a morbid condition. Beyond the epiglottis, we come upon the cavity of the larynx. This is bounded above by a plane, sloping downward and backward, from the crest of the epiglottis, to the apices of the arytenoid cartilages above, and below by a plane passing through the lower border of the cricoid cartilage. The entrance to the larynx is somewhat triangular in shape, and is bounded in front by the epiglottis, laterally by two folds of mucous membrane, which stretch from the sides of the epiglottis to the arytenoid cartilages, viz., the aryteno-epiglottidean folds. The laryngeal cavity is divided into two portions by the vocal cords, the opening between which is called the rima glottidis. That portion above the vocal cords is called the supra-glottic portion, while that below is called the sub-glottic portion.

Immediately below the crest of the epiglottis is found a rounded prominence, *the cushion of the epiglottis*. This is really due to the prominence of the petiolus, although there is a certain amount of adenoid tissue, together with fatty matter, found at this point. Passing from the side of the epiglottis to the apex of each arytenoid cartilage, is a fold of mucous membrane, *the ary-epiglottic fold*, which is supported by ligamentous and muscular fibres. At the edge of this fold, immediately over the arytenoid, may be seen the prominence formed by the cartilage of Santorini, and in front of this the projection of the cartilage of Wrisberg.

Passing farther down into the cavity of the larynx, we come upon two folds of mucous membrane, one on either side, *the ventricular bands*, which extend in a horizontal plane from the receding angle of the thyroid, to the arytenoid cartilages. These bands or folds of mucous membrane are supported by the superior thyro-arytenoid ligaments, bands of elastic tissue, whose attachments in front are on either side of the receding angle of the thyroid immediately below the attachment of the epiglottis, while posteriorly they are attached to the interior surface of the arytenoid cartilages. Immediately below the ventricular bands, or false vocal cords as they are sometimes called, is found on either side an oblong or elliptical fissure which separates them from the true vocal cords. These fossæ extend nearly the whole length of the vocal cords and the ventricular bands, and are called *the ventricles of the larynx*. They are bounded externally by the thyro-arytenoid muscles. In the anterior part of each ventricle is found a narrow, pouch-like cavity, lined with mucous membrane, *the sacculus laryn-*

gis. This is a membranous sac, which extends up between the ventricular band and the inner surface of the ala of the thyroid cartilage. It curves upward and backward, and is said to resemble in form a Phrygian cap. It varies greatly in depth in different persons, and occasionally is found extending as far as the upper border of the thyroid, and in rare instances it has been traced beyond the epiglottis, to the base of the tongue. A large number of muciparous glands are found in the sacculus, which has led to the theory that this cavity constituted a lubricating reservoir for the vocal cords. It is more probable, however, that it is merely a rudimentary survival of organs, which obtain an enormous development in the quadrumana, reaching even to the shoulders and axillæ. This view would seem to be sustained by the cases reported by Bennett,[1] in which post-mortem examination revealed the laryngeal sacculi on each side, extending nearly to the thyro-hyoid ligament. Gruber[2] also reports two instances in which a similar abnormality was symmetrical, while in two other cases[3] he observed it unilateral, one on the right and one on the left side.

Immediately below the ventricular bands and parallel with them are found *the true vocal cords.* These are two stout fibrous bands composed of yellow elastic tissue. Anteriorly they are inserted into the lower portion of the receding angle of the thyroid cartilage, immediately within the insertion of the thyro-arytenoid muscles. Posteriorly they are divided into three sets of fibres, one of which is inserted into the anterior angle or vocal process of the arytenoid cartilage; a second portion is inserted into the anterior face of the same cartilage, as high up as the ventricular bands; while a third is inserted into the capsular ligament which invests the crico-arytenoid joint, and also into the anterior face of the expanded portion of the cricoid ring. A cross-section of the vocal cord shows it to be a triangular prism, the apex of which presents to its fellow, while the base presents outward, and affords attachment in its whole length to the fibres of the thyro-arytenoid muscle. We thus find the vocal cord to be practically a ligamentous border of this latter muscle. *The glottis or rima-glottidis* is the name given to the opening between the true vocal cords. In the male, its length varies somewhat, but the average, probably, in the adult male is about seven-eighths of an inch. Anteriorly, of course, the cords are in contact. Posteriorly, when dilated to its widest extent, the opening will measure about a half-inch.

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[1] Dublin Quarterly Journ. of Med. Sciences, 1865, vol. xl., p. 427.

[2] Op. cit., 1874, p. 606; also "Beobacht. an der menschlich. und vergleichend. Anat.," Berlin, 1879, p. 46.

[3] Virchow's Arch., 1876, vol. lxvii., p. 61. Ibid., 1879, vol. lxxviii., p. 106.

An anomalous condition of the vocal cords is occasionally met with, which consists in a union, which, commencing at the anterior commissure, extends backward from a quarter to half the distance to the arytenoid. This is usually described as a web of the vocal cords. It is a congenital condition, and consists in a union of the mucous membrane probably, rather than of the fibro-elastic tissue. Instances of this have been reported by Scheff,[1] Zurhelle,[2] Elsberg,[3] De Blois,[4] and Poore.[5]

The web is usually divided by means of the knife, and readhesion prevented by cauterization or other methods.

In a case reported by Mackenzie,[6] the web was of a papillomatous character, and was removed with forceps.

THE MUSCLES.—Various classifications have been made of the muscles which preside over the movements of the larynx, based both on physiological and anatomical investigation. Thus, they have been divided into intrinsic and extrinsic muscles, glottis-openers and glottis-closers, phonatory and respiratory muscles, etc. These classifications have to do mainly with physiological considerations, and in no way aid us in our study of the larynx. Moreover, any classification which restricts each individual muscle to a particular function is to an extent misleading. They are presented here, therefore, without grouping.

The most important muscles of the larynx, and those which act directly upon the vocal cords are: the crico-thyroid, the crico-arytenoideus posticus, the crico-arytenoideus lateralis, the thyro-arytenoideus, and the arytenoideus.

The Crico-Thyroid (see Fig. 42).—The crico-thyroid is a triangular shaped muscle, which arises from the anterior portion and side of the cricoid ring and divides into two fasciculi, one of which passes almost directly upward, to be inserted into the inner portion of the lower border of the thyroid cartilage anteriorly, while the other fasciculus passes obliquely upward and backward and is inserted into the lower border of the thyroid cartilage, immediately behind the insertion of the first fasciculus.

It was formerly supposed that this muscle, acting from the cricoid as a fixed point, drew the thyroid down over it in such a way as to produce tension and elongation of the vocal cords. The elaborate series of experiments made by Hooper,[7] followed by the

[1] Allg. Wien. med. Zeit., 1878, pp. 280 and 289.
[2] Berl. klin. Woch., 1869, p. 544.
[3] Trans. Amer. Med. Ass'n, 1870, p. 217.
[4] Trans. Amer. Laryngol. Ass'n, 1884, p. 42.
[5] Trans. of the Seventh Internat. Med. Congress, London, 1881, vol. iii., p. 316.
[6] Trans. Path. Soc. London, 1874, vol. xxv., p. 35.
[7] Trans. Amer. Laryngol. Ass'n, 1883, p. 118.

investigations of Moura,[1] Desvernine,[2] and others, have shown conclusively that the thyroid is the fixed point, being rendered so by the action of the thyro-hyoid, sterno-thyroid, and laryngo-pharyn-

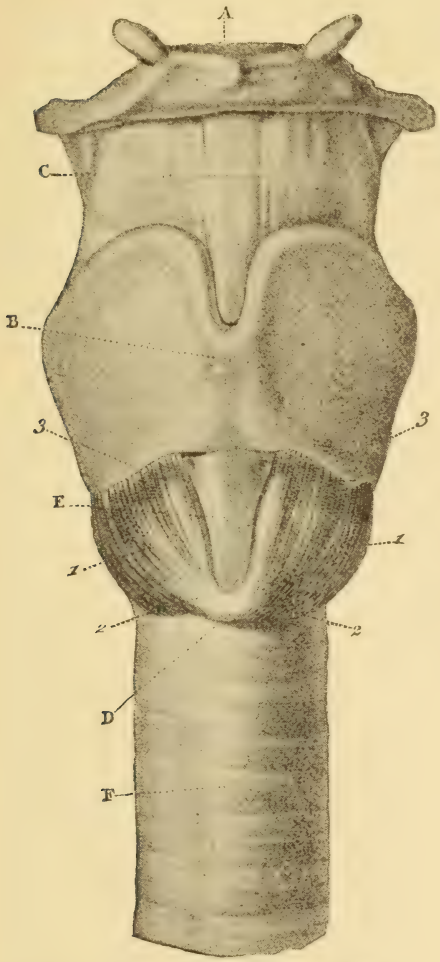

FIG. 42.—The Crico-Thyroid Muscle, Viewed Anteriorly (Broca). A, Hyoid bone; B, thyroid cartilage; C, thyro-hyoid membrane; D, cricoid cartilage; E, crico-thyroid membrane; F, trachea; 1, 1, crico-thyroid muscle; 2, 2, origin of the muscle from the anterior portion and side of the cricoid; 3, 3, insertion into the lower border of the thyroid.

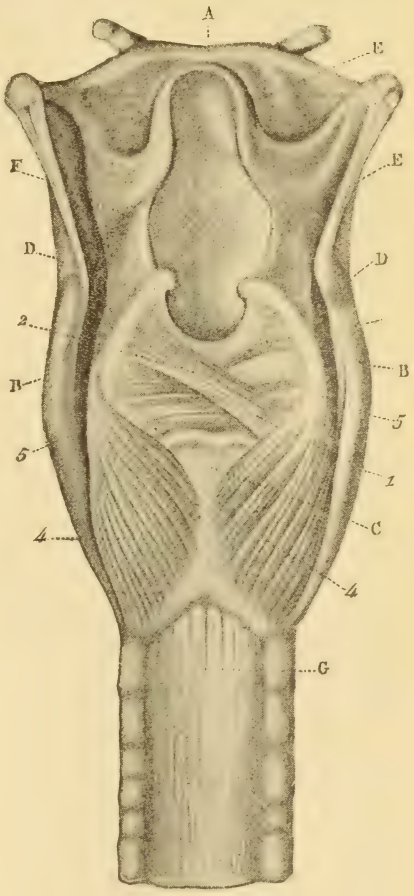

FIG. 43.—The Arytenoid and Posterior Crico-arytenoid Muscles (Broca). A, Hyoid bone; B, B, posterior border of the thyroid; C, posterior face of cricoid; D, D, posterior border of the arytenoid; E, epiglottis; F, F, ary-epiglottic folds; G, trachea; 1, arytenoid muscle; 2, 3, oblique fibres of same; 4, 4, crico-arytenoid posterior muscles; 5, 5, their insertion in the outer angle of the base of the arytenoid cartilage.

geal muscles, and the cord is elongated and rendered tense by the cricoid being drawn upward and backward. This view, however,

[1] Annal. des Mal. de l'Oreille, 1885, vol. xi., p. 71.
[2] Journal of Laryngology, 1888, vol. ii., p. 47.

had been previously advocated as far back as the time of Cowper[1] and Magendie,[2] and still later was adopted by Jelenffy,[3] Schmidt,[4] Elsberg,[5] and others.

The Posterior Crico-Arytenoid (see Fig. 43).—The posterior crico-arytenoid muscles are somewhat triangular in shape, and arise from the posterior surface of the expanded portion of the cricoid cartilage, and have their insertion in the outer angle or muscular process of the base of the arytenoid cartilage. The action of each muscle, having its fixed point on the cricoid cartilage, is to draw the outer angle of the arytenoid cartilage backward, thus throwing its anterior angle or vocal process, to which is attached the vocal cord, outward, in this way acting as a glottis-opener (see Fig. 44).

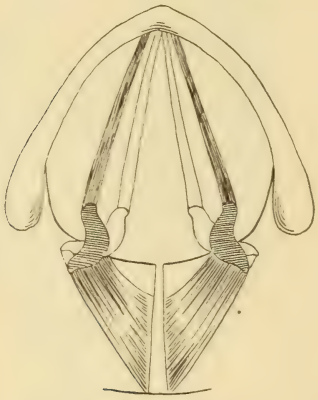

FIG. 44.—The Glottis-Opening Action of the Posterior Crico-Arytenoid Muscles, shown by Diagram.

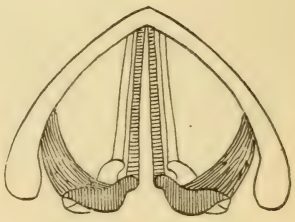

FIG. 45.—The Glottis-Closing Action of the Lateral Crico-Arytenoid Muscles, shown Diagrammatically.

According to Ruhlmann,[6] each of these muscles is composed of two fasciculi, the outermost or more horizontal fibres acting to draw the whole of the arytenoid cartilage directly outward, away from its fellow, while the inner and lower fibres rotate it on its base—a view which has been strikingly confirmed in a case of cancer of the œsophagus reported by Hayes,[7] in which the malignant disease first destroyed the central fibres, preventing rotation of the arytenoids, the cords being in apposition in front of the vocal processes, while they were separated behind them. Still later, the

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[1] "Myotomia Reformata," 1724.
[2] "Mémoire sur l'Usage de l'Épiglotte dans la Déglutition," Paris, 1813.
[3] "Der Musculus Crico-thyreoideus :" Arch. für die gesammte Physiol., 1873, vol. vii.
[4] "Die Laryngoscopie auf Thieren," 1873.
[5] "Paralysis of the Muscles of the Larynx :" Arch. of Laryn., 1882, vol. iii., p. 195.
[6] "Sitzungsbericht. der k. Akad. der Wissenschaft," Wien, 1874, vol. lxix., p. 257.
[7] Dublin Journ. of Med. Sciences, 1881, 3d ser., vol. lxxi., p. 193.

outer fibres were destroyed and the arytenoids fell together, producing the condition seen in complete abductor paralysis.

The Kerato-Cricoid Muscle.—Merkel[1] describes a bundle of muscular fibres which arises at the side of the cricoid origin of the posterior crico-arytenoid muscle, and is inserted into the posterior portion of the lower horn of the thyroid. He gives it the name of the kerato-cricoid muscle. Merkel states that it is unilateral, although Turner[2] says that it is occasionally bilateral, and is found in twenty-one and eight-tenths per cent of cases.

The Lateral Crico-Arytenoid.—These muscles have their origin on the upper border of the side of the cricoid cartilage, and, passing upward and backward, are inserted into the outer angle or muscular process of the arytenoid cartilage, immediately in front of the insertion of the preceding muscle. Having their fixed point in the cricoid they draw the outer angle of the arytenoid cartilage forward, thus throwing its vocal process inward and closing the glottis (see Fig. 45).

The Thyro-Arytenoid.—These muscles have their origin in the lower portion of the receding angle of the thyroid cartilage and the crico-thyroid membrane, and, passing backward along the outer side of the vocal cords, are inserted into the base and anterior surface of the arytenoid cartilage. Each muscle is composed of two fasciculi, the inferior and superior, or, as they are ordinarily called, the internal and external. Each fasciculus arises from the receding angle of the thyroid: The internal passes backward and is attached to the vocal cord in its whole length, while posteriorly it is inserted into the external surface of the vocal process; the external fasciculus spreads out more widely, and is inserted into the anterior face of the arytenoid cartilage, as far outward as the muscular process. The fibres of this fasciculus pass under the sacculus laryngis. The action of this muscle as a whole is to approximate the arytenoid cartilages to the thyroid, thus shortening and relaxing the vocal cords. The action of the internal fasciculi is to bring the edges of the cords together, and they thus have an important function in the production of the high notes in the singing voice, while the external fasciculi have mainly to do with relaxation of the cords, and are also supposed to have a function in compressing the sacculus laryngis.

The Superior Thyro-Arytenoid. — In addition to the above, Schrötter[3] describes a bundle of muscular fibres which he designates as the superior or oblique thyro-arytenoid muscle, which,

[1] "Stimm- und Sprachorgans," Leipsic, 1857, pp. 132 and 133.

[2] Edinburgh Med. Journal, 1859, vol. iv., p. 744.

[3] "Vorlesungen über die Krankheiten des Kehlkopfes," Wien, 1887, p. 28.

having its origin near the receding angle of the thyroid, just above the former muscle, passes backward, outward, and downward, and is inserted into the muscular process of the arytenoid cartilage. It serves to re-enforce the action of the former muscle, especially in the finer movements of the singing voice.

The Arytenoid.—The arytenoid is a single muscle which passes from the posterior surface and outer border of one arytenoid cartilage to the corresponding part of the opposite cartilage. It is usually described as composed of three layers, two oblique and one transverse. The oblique fibres pass from the apex of one cartilage to the base of the opposite, and conversely. The transverse fibres, which are the deepest, pass directly across in a horizontal direction from one cartilage to the other. A better anatomical division would be to describe the tranverse fibres alone as composing the arytenoid muscle, while the oblique fibres belong to the ary-epiglottic muscles. The action of the arytenoid muscle is to approxi-

FIG. 46.—Action of the Arytenoideus Muscle in Closing the Glottis, shown by Diagram.

mate the arytenoid cartilages, and to close that portion of the rima glottidis which is included between the vocal processes (see Fig. 46).

The Thyro-Epiglottic and Ary-Epiglottic Muscles.—The above muscles have their principal action upon the vocal cords. In addition to this, we have two muscles which act upon the epiglottis and the opening of the larynx, viz., the thyro-epiglottic and the ary-epiglottic muscles.

The thyro-epiglottic has its origin at the side of the receding angle of the thyroid cartilage, immediately external to the thyro-arytenoid muscle; it passes outward around the sacculus laryngis, and is inserted into the sides of the epiglottis, some of its fibres being lost in the ary-epiglottic fold. This muscle is supposed to act as a depressor of the epiglottis.

The ary-epiglottic muscle arises from the posterior surface of the base of the arytenoid cartilage, and passes up in an oblique direction to the apex of the opposite arytenoid, to which it is loosely attached, and then passes forward in the ary-epiglottic fold, in which some of the fibres are lost, while others pass forward and upward over the inner and upper portion of the sacculus laryngis, and are inserted by a broad attachment into the margin of the epiglottis, some of its fibres spreading on to its anterior surface.

This muscle, therefore, with its fellow, makes almost a complete

girdle around the entrance of the laryngeal cavity. In contraction, its action is necessarily to constrict the aperture of the larynx, while at the same time probably some of its fibres act to compress the sacculus laryngis.

The Sterno-Hyoid and Thyro-Hyoid Muscles.—In addition to the above, there are certain muscles, usually described as belonging to the infra-hyoid region, which should be described in this connection, in that they possess a somewhat important function in fixing the larynx during phonation. These are the sterno-thyroid and thyro-hyoid. The sterno-thyroid arises from the posterior surface of the manubrium of the sternum, and occasionally from the cartilage of the first rib, and has its insertion in the side of the wing of the thyroid cartilage; while the thyro-hyoid arises from the side of the wing of the thyroid cartilage, immediately above the insertion of the sterno-thyroid, and, passing upward, is inserted into the lower edge of the body and great wing of the hyoid bone. The action of the sterno-thyroid, therefore, would seem to be to depress the larynx, while the thyro-hyoid elevates it. The two muscles, however, acting in harmony, subserve the purpose of steadying the larynx during phonation, and thus enable the intrinsic muscles of the larynx to perform their function in phonation, with a greater degree of nicety. This function is also aided somewhat by certain small muscular fibres, to which the name of *the laryngo-pharyngeal muscle* is given, which have their origin from the posterior border of the cricoid cartilage, and, passing backward around the pharynx, are inserted into the body of the fourth or fifth cervical vertebra behind.

THE MUCOUS MEMBRANE.—The mucous membrane which lines the larynx is continuous with that of the pharynx and oral cavity above and with that of the trachea below. It covers both the anterior and posterior surfaces of the epiglottis, to which it is closely adherent, and is then reflected over the ary-epiglottic muscle, forming the ary-epiglottic fold, and subsequently over the superior thyro-arytenoid ligament, from which it passes into and forms the lining of the sacculus laryngis, and thence passes over the true vocal cords, where it forms an exceedingly thin and closely adherent membrane. Passing below the rima, it becomes continuous with the lining membrane of the trachea. Below the ventricular bands, it follows the rule which governs mucous membranes lining the air tract, and is covered with columnar ciliated epithelium, with the exception of the true vocal cords, which are covered with squamous epithelium. Above the ventricular bands, the ciliated epithelium is found on the lower half of the posterior face of the epiglottis. In the remaining portion, the epithelium is of the squamous variety.

The Muciparous Glands.—The lining membrane of the larynx is richly endowed with muciparous glands, which are especially numerous upon the posterior face of the epiglottis, along the posterior margin of the ary-epiglottic folds, and in front of the arytenoid cartilages, as well as in the sacculus laryngis.

ARTERIES.—The arterial supply of the larynx is derived from branches of the superior and inferior thyroid arteries, the superior thyroid being a branch of the external carotid, while the inferior is a branch of the thyroid axis. These laryngeal branches are divided into two sets, anterior and posterior. The anterior

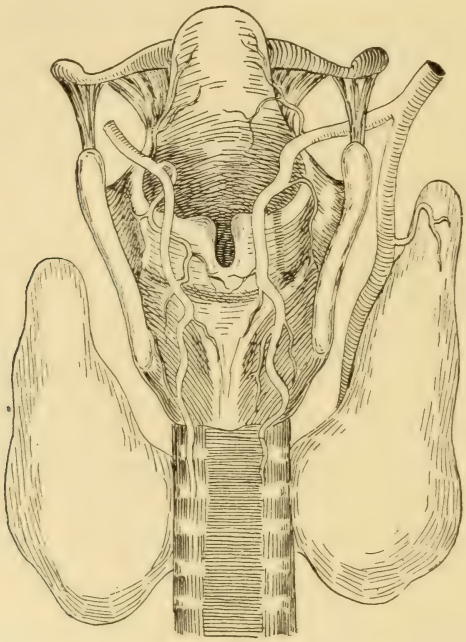

FIG. 47.—Arterial Supply of the Larynx, Posterior View, showing the Distribution of the Superior Laryngeal Artery.

set consists of two branches, the superior laryngeal and inferior laryngeal, both branches of the superior thyroid artery.

The superior laryngeal (see Fig. 47) passes inward in connection with the superior laryngeal nerve, between the greater cornu of the hyoid bone and the upper border of the thyroid cartilage, and enters the larynx through the thyro-hyoid membrane, after passing beneath the thyro-hyoid muscle. It is distributed to the epiglottis and to the mucous membrane, muscles, and glands of the upper and anterior portion of the larynx.

The inferior laryngeal artery (see Fig. 47), or *the crico-thyroid* as it is often called, arises from the superior thyroid artery, almost im-

mediately opposite the lower border of the thyroid cartilage and passes directly inward until it impinges upon the crico-thyroid membrane, where it divides into two branches, the lower of which anastomoses with a branch from its fellow of the opposite side, and, perforating the membrane, enters the larynx, and is distributed to the mucous membrane below the vocal cords. The upper branch, passing beneath the border of the thyroid cartilage, anastomoses with branches from the superior laryngeal artery. A small branch also passes up on the outer face of the thyroid cartilage, and anastomoses with twigs from the hyoid branch of the superior thyroid artery.

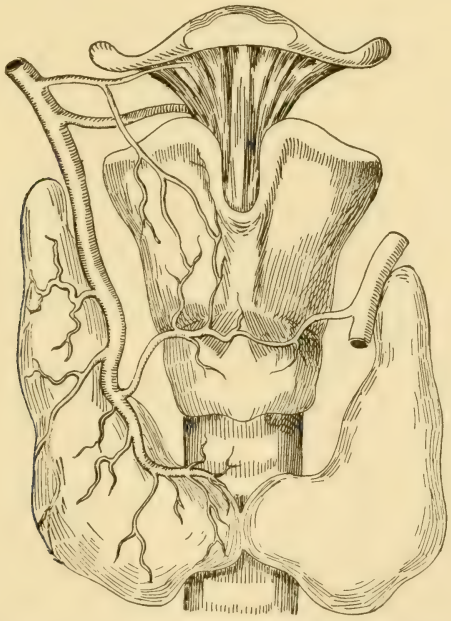

FIG. 48.—Arterial Supply of the Larynx, Anterior View, showing the Distribution of the Inferior Laryngeal, with the Origin of the Superior Laryngeal Artery.

A second group is made up of *the posterior laryngeal artery*, which is a branch of the inferior thyroid. It passes upward in connection with the recurrent laryngeal nerve, until it reaches the posterior wall of the larynx near the crico-arytenoid articulation, where it divides into two branches, one of which is distributed to the posterior crico-arytenoid muscle, while the other passes upward, to anastomose with branches of the superior laryngeal artery. The course of the larger branches, as a rule, is quite close to the cartilaginous framework, while the smaller branches approach more nearly to the surface, where they are broken into a fine network.

VEINS.—The veins of the larynx follow the general course of the arteries, and empty into the superior, middle, and inferior thyroid veins, which terminate in the internal jugular.

THE LYMPHATICS.—The lymphatics of the larynx form a close network throughout the whole of its mucous membrane. They eventually unite to form two main trunks on either side, viz., one above each ventricle, and one below the cricoid cartilage. The upper trunk is formed by a union of the lymphatic vessels which are distributed to the epiglottis, and that portion of the larynx which is above the vocal cords, and passes out from the cavity, above the superior border of the thyroid cartilage, and empties into the lymphatic glands which lie on either side of the larynx, near the anterior border of the sterno-mastoid muscle. The lower trunk is formed by a union of the lymphatic vessels which are distributed to the mucous membrane below the glottis, and, emerging from the larynx below the border of the thyroid cartilage, empties into the lymphatics distributed on either side of the trachea. These lymphatic trunks, as we have designated them, are made up of a group of several distinct vessels. The lymphatic distribution in the supra-glottic portion of the larynx is exceedingly rich, while in the mucous membrane covering the cords, and in the sub-glottic portion of the larynx, it is somewhat diminished.

Lymphatic tissue, according to Luschka,[1] is not found diffused beyond the mucous membrane of the larynx, but only at the borders of the epiglottis and in the ary-epiglottic folds. Rheiner[2] believed that the presence of this tissue was an evidence of a catarrhal condition; while Heitler[3] has found it distributed not only to the ary-epiglottic folds, but also to the mucous membrane over the arytenoids, and especially over the cartilages of Santorini, in the inter-arytenoid and thyroid commissures, and in the anterior part of the laryngeal ventricles. So extensive is this aggregation of tissue in this last situation that Hill[4] has given it the name of the laryngeal tonsil.

NERVES.—The larynx receives its motor and sensory innervation from the superior and the inferior or recurrent laryngeal nerves.

The superior laryngeal nerve is a branch of the pneumogastric, which, according to the accepted view, supplies general sensation to the mucous membrane, and motor innervation to the crico-thyroid muscle and possibly to the arytenoid muscle. It has its origin in the inferior ganglion of the pneumogastric, from whence

[1] "Der Kehlkopf des Menschen," Tübingen, 1871.
[2] Virchow's Archiv, vol. v.
[3] Med. Jahrbuch, Vienna, 1874, vol. iv., p. 374.
[4] "Tonsillitis," etc., London, 1889.

it passes down by the side of the pharynx, and divides above the superior border of the thyroid cartilage into two branches, the external and internal laryngeal. The external branch passes down on the outer side of the larynx, and pierces the crico-thyroid muscle. The internal branch pierces the thyro-hyoid membrane, in connection with the superior laryngeal artery, and is distributed over the whole of the mucous membrane lining the laryngeal cavity, and also to the base of the tongue, supplying general sensation. A filament is also sent to the arytenoid muscle. It also joins the recurrent laryngeal nerve. The motor filaments which supply the crico-thyroid and arytenoid muscles probably have their origin in the spinal accessory nerves.

The inferior or recurrent laryngeal nerve supplies the muscles of the larynx with motor innervation, and is a branch of the pneumogastric, which it leaves, however, somewhat differently on either side. On the right side, it arises on a level with the right subclavian artery, round which it winds from before backward, and then passes upward and inward, approaching the trachea. On the left side it rises on a level with the concavity of the arch of the aorta, and, passing around this vessel, from before backward, ascends until it approaches the trachea, when it passes upward in the sulcus between it and the œsophagus. The nerve on either side passes up immediately behind the point of articulation of the lesser horn of the thyroid cartilage with the cricoid, and enters the laryngeal cavity, giving off branches to the posterior crico-arytenoid muscle, and also, according to Von Ziemssen,[1] sending sensitive branches, which penetrate the muscles and are distributed to the mucous membrane of the laryngeal cavity, below the glottis. As the nerve passes upward in the laryngeal cavity it distributes branches to the remaining muscles of the larynx, viz., the lateral crico-arytenoid, the arytenoideus, the thyro-arytenoids, the thyro-epiglottic, and ary-epiglottic muscles.

The right recurrent nerve, after passing round the subclavian artery, is in close contact with the apex of the lung of that side, an anatomical fact which it is important to remember in the rare instances in which we meet with right recurrent paralysis.

The median laryngeal nerve, springing from the pharyngeal branch of the pneumogastric, is known to exist in some of the lower animals, and, while it has never been isolated in the human subject, Exner[2] takes the ground that it is present, but so intricately involved in the pharyngeal plexus as to preclude an anatomical demonstration. He bases this view purely on physiological ex-

[1] Ziemssen's "Cyclopedia," Amer. edit., vol. vii., p. 918.

[2] Monatschrift für Ohrenheilkunde, Dec., 1884.

perimentation. According to this observer, all the muscles of the larynx, with the exception of the external thyro-arytenoid, receive motor innervation from more than one nerve—a fact which has been established by Mandelstamm,[1] who has shown that all the muscles of one side of the larynx not only receive double innervation from the superior and inferior nerve, but also by a sort of cross-action, from the nerves of the opposite side. Exner takes the ground that this double innervation of the muscles establishes a general law. The crico-thyroid muscle, however, can only be shown to receive innervation from the superior nerve. In order, therefore, to bring this muscle under the action of the general law of double innervation, he argues the existence of a median laryngeal nerve, supplying this muscle, in connection with the superior.

We thus find the laryngeal muscles endowed with an unusually rich nerve supply. Exner goes still further, and states that there is a great variation in individuals, as regards the distinct source of innervation in each special muscle: in other words, that in no two individuals probably, is the distribution of the nerve fibres to the laryngeal muscles exactly alike. This view will serve to explain many of the curious features which are occasionally met with in cases of paralysis of the laryngeal muscles. Exner fails to bring the external thyro-arytenoid muscle under his general law of double innervation, although in many instances he demonstrates a cross-action here by which this muscle receives innervation from the recurrent nerves of both sides. Exner's conclusions were based not only on physiological experiment, but on microscopic study of successive cross-sections of the larynx, whereby he directly traced nerve fibres from one side of the larynx to their termination in the muscular structures of the opposite side.

Onodi[2] accepts the anatomical truth of Exner's teaching that the nerve fibres pass across from one side of the larynx to the other, and also between the superior and inferior nerves of the same side, but questions his conclusions that they are motor fibres, in that section of the nerve fails to establish a paretic or paralytic condition. He argues, therefore, that the nerve fibres which Exner has traced to their ultimate distribution are not motor in character, but are merely sensory fibres for distribution in the mucous membrane.

Exner's teaching certainly serves to make clear many points hitherto obscure in connection with our clinical cases of laryngeal paralysis, and will, I think receive general acceptance, notwithstanding Onodi's objections.

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[1] Monatschrift für Ohrenheilkunde, Dec., 1884.

[2] Monatschrift für Ohrenheilkunde, 1890, vol. xxiv., pp. 311 and 344.

We are usually taught that the recurrent laryngeal nerve derives its motor fibres from the spinal accessory, and, moreover, that the spinal accessory is the sole source of motor innervation in the larynx. Onodi,[1] however, takes the ground that the larynx receives motor fibres which have their source in the spinal cord as far down as the lower cervical and first dorsal spinal ganglia of the sympathetic system, the course of the fibres being directly from the spinal cord to the first thoracic ganglion, then through the communicating branch between this and the last cervical ganglion, and from this directly to the recurrent nerve. This will demonstrate how a destructive morbid lesion of the ganglia of the spinal accessory nerve may occur, without resulting in the complete paralysis of the laryngeal muscles, they still receiving a certain amount of motor innervation from the spinal cord in the manner shown by Onodi. In this connection it should be stated that the motor fibres which innervate the larynx, and which reach the recurrent nerve through the spinal accessory, have their origin in that root of the spinal accessory which rises in the medulla oblongata.

[1] Loc. cit., p. 345.

CHAPTER XXVI.

THE PHYSIOLOGY OF THE LARYNX.

THE larynx possesses two functions in the economy: It is endowed with certain movements constituting its respiratory function, and it also contains the mechanism by which the current of expired air is thrown into sonorous vibrations, which are subsequently converted into articulate language, by means of the tongue, lips, cheeks, etc., thus constituting its function in phonation. This latter function is employed both in ordinary conversation, and in the singing voice, wherein the highest powers of the larynx are brought into play.

THE FUNCTION OF THE LARYNX IN RESPIRATION.

The general contour of the larynx in health is such that, while it opposes no obstacle whatever to the outgoing current of air in expiration, the ingoing current of air would be so far obstructed as to lead to serious consequences did not nature provide for the glottis being widely opened during inspiration, by muscular action. In other words, the tendency of the outgoing current of air is to open the glottis with little effort; the tendency of the ingoing current of air would be to close it, the two vocal cords forming a valve, as it were, whose action would be not unlike that of the mitral valves of the heart. With every act of inspiration, therefore, the glottis is opened by the posterior crico-arytenoid muscles. These muscles, as we know, arising from the posterior surface of the expanded portion of the cricoid ring, pass outward and upward for insertion into the outer angle or muscular process, of the base of the arytenoid cartilage. By their contraction, they turn the arytenoid on itself, drawing its outer angle backward, thus throwing its anterior angle outward and opening the glottis. The opening of the glottis is still further accomplished by the action of the outer fibres of this muscle, which act to draw the whole cartilage outward on the elliptical facet, which, as we know, runs transversely on the cricoid cartilage.

The respiratory function of the larynx, therefore, consists in this glottis-opening action of the posterior crico-arytenoid muscles. During the act of expiration, muscular action is simply relaxed,

and the expired current of air makes a passive exit from the lungs. This glottis-opening movement is purely of a reflex character, and is presided over by the respiratory centre in the floor of the fourth ventricle. The action of this muscle is coincident with and excited by the same impulses which excite the ordinary muscles of inspiration. According to the old Marshall-Hall teaching, this impulse is caused by the accumulation of carbonic acid in the pulmonary vessels, and is conveyed to the medulla through the branches of the pneumogastric nerve.

A later and more generally accepted theory in regard to this matter is that the respiratory act is excited primarily by the influence of the current of deoxygenated blood passing through the respiratory centres, experiments[1] having shown that the presence of carbonic acid in the venous blood, passing through the medulla, excites the respiratory act, and furthermore that, as the carbonic acid increases, these acts become more rapid and more vigorous.

The Function of the Larynx in Phonation.

The phonatory function of the larynx is exercised by an exceedingly simple mechanism, by means of which the respiratory current of air is partially arrested by the approximation of the vocal cords, and is then driven through the chink thus formed in such a way that the column of air is thrown into sonorous vibrations, which are subsequently converted into articulate language by the parts above. We thus find that, whereas the respiratory function of the larynx has to do with the current of air in inspiration, the phonatory function has to do with the current of air in expiration. The larynx is thus endowed with two functions, which, however, by an exceedingly simple and yet harmonious adjustment of mechanism, are performed without interference; in fact, the two functions seem to be supplementary of one another, the involuntary function of respiration being carried on during the intervals of the voluntary function of phonation.

Before the discovery of the laryngoscope, our knowledge of the true action of the larynx in phonation was purely speculative. A number of theories were advanced, but the very large majority of writers have considered that the action of the larynx was that of the reed pipe, the vocal cords acting as reeds in the production of sound. This view was the one entertained by Cuvier,[2] Magendie,[3]

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[1] "Foster's Handbook of Physiology," 3d edit., New York, 1880, p. 377.

[2] "Leçons de l'Anat. comparée," Paris, 1800, vol. iv., pp. 496 and 522.

[3] "Précis de Phys.," Paris, 1833, vol. i., p. 301.

Malgaigne,[1] and especially by Johannes Müller,[2] who demonstrated the truth of this view by an admirable series of experiments on the fresh larynx.

Ferrein[3] considered the action of the larynx similar to that of a stringed instrument. Savart[4] likened it to a bird's whistle; while Geoffroy St. Hilaire[5] asserted that in the chest voice the action of the larynx was that of a stringed instrument, in the falsetto notes its action was that of a flute. Garcia's[6] discovery of the laryngoscope, however, with his unrivalled series of observations on the human voice, entirely cleared up this question, and demonstrated conclusively that the action of the larynx is really that of a reed instrument, and that the column of expired air is thrown into sonorous vibrations by the vocal cords. For the accomplishment of this purpose, the cords are brought into apposition in the median line, and held firmly in position, and rendered tense by muscular action, when the air is forced through, by the respiratory muscles of the chest, in such a way as to throw the edges of the cords into vibration. In this manner, the column of air in the upper air tract is also thrown into vibration, and, as has been stated, converted into articulate language by the movements of the tongue, lips, palate, etc. The muscles concerned in the approximation of the cords are primarily the lateral crico-arytenoid and the inter-arytenoid muscles, the former pulling forward the outer angle of the base of the arytenoid cartilages, thus rotating inward its anterior angle or vocal process, to which is attached the vocal cord, while the latter muscle simply brings into apposition the two arytenoid cartilages. The approximation of the cords is thus an exceedingly simple matter, and one clearly understood. The mechanism by which the cords are rendered tense, however, is somewhat complicated. The muscles which are concerned in this function are the crico-thyroid and the thyro-arytenoid muscles. The action of the crico-thyroid is quite evident; in drawing the cricoid cartilage upward and at the same time displacing it backward, the vocal cords are lengthened and rendered more tense. All authorities unite, I think, in the statement that the nicer tension of the cords is regulated by the thyro-arytenoid muscle. The apparent action of this muscle, passing as it does from the anterior face of the arytenoid cartilage to the receding angle of the thyroid, is by its contraction to approximate

[1] Arch. générales de Médecine, 1831, vol. xxv., pp. 201 and 327.

[2] "Elements of Physiology," English edit., 1837, vol. i., Appendix; vol. ii., sec. 3.

[3] "Histoire et Mémoires de l'Acad. royale des Sciences," 1741, pp. 51 and 409.

[4] Annales de Chimie et de Physique, 1825, vol. xxx., p. 64.

[5] "Philosophie anat.," Paris, 1818, p. 284.

[6] "Physiological Observations on the Human Voice," Proc. Royal Society, London, 1855, vol. vii., No. 13.

the two attachments of the vocal cord, and thus produce relaxation. We must remember, however, that this muscle is made up of a number of fasciculi which are attached to the vocal cord in its whole extent, the vocal cord really being an aponeurosis of the muscle, as it were. It is quite a mistake to think that high tension of the vocal cords involves the necessity of their being stretched to their utmost between the arytenoid cartilage and the receding angle of the thyroid, thus bringing their edges into absolute parallelism: more probably, I think, the tension of the vocal cords involves their edges being held in a state of firmness and rigidity, whether the chink be a straight line or an oval opening. In this way, the greater the rigidity of the cord, the higher the number of vibrations per second into which it is thrown by the action of a column of air forced through the opening, therefore the higher the pitch of the sound produced. The vocal cords being then stretched from before backward, and rendered tense in the median line by the action of the crico-thyroid muscles, the thyro-arytenoid, whose fibres are attached throughout their whole length to the outer border of the cord, acts not only to increase this tension, but to give it that fine adjustment which is especially necessary in the higher powers of phonation, viz., in the singing voice.

A still further action of the thyro-arytenoid muscle is described by Browne and Behnke,[1] in that by the action of those fibres which are distributed on the anterior face of the arytenoid, and out toward the muscular process, the action of the lateral crico-arytenoid muscle is re-enforced, and the vocal processes approximated.

We speak of the tension of the cords as being regulated by the crico-thyroid and thyro-arytenoid muscles: it is understood, of course, that this function is aided somewhat by the inter-arytenoid and lateral crico-arytenoid muscles, which act to steady and hold firmly the arytenoid cartilage on its base.

The epiglottis has been supposed by many to possess a certain function in phonation; and yet on careful examination with the laryngoscope, one fails to detect any movement in this cartilage other than is accounted for by the movements of the larynx itself. Thus, in the utterance of low notes the larynx moves downward and forward in such a way as to throw the epiglottis over: the movement, however, is entirely due to the movement of the larynx. The epiglottis also has been thought to act as a sounding board, as it were, upon which vocal waves on their emergence from the larynx impinge, and are reflected backward into the pharynx. The true and main function of this cartilage undoubtedly is in closing the entrance of the larynx during the act of deglutition.

[1] "Voice, Song, and Speech," Amer. edit., New York, 1884, p. 63.

Owing to the fact that the lower animals, in whom the ventricles of the larynx are largely developed, possess the ability of uttering unusually loud cries, these cavities acting as resonant chambers, it has been argued that they are endowed with a similar function in man. The analogy scarcely holds good, when we consider that the larynx of the lion and tiger has no ventricles.

The voice is endowed with pitch, intensity, and quality. The pitch of a voice depends purely upon the number of vibrations of the vocal cords. The greater the number of vibrations, of course, the higher the pitch. This is regulated purely by the action of the muscles heretofore described. By the intensity of the voice is meant merely its loudness, which of course is dependent entirely on the amount of expiratory effort expended in driving the air through the chink of the glottis. The quality or timbre of the voice is that which gives each voice its special and individual character. This is largely dependent upon the general anatomy of the vocal apparatus, including the larynx, pharynx, nasal and accessory cavities.

Our knowledge of this subject is due entirely to the ingenious investigations of Helmholz,[1] who has demonstrated that the vowel sounds, instead of being simple, are composite, and are made up not only of the fundamental note of the larynx, but, in addition, of certain overtones which belong to the oral, nasal, and the other accessory cavities. Each one of these cavities possesses a fundamental note. This fundamental note is constant in all except the mouth, where of course it varies according to its form and the position of the soft parts within it. The individuality of the voice, therefore, is the result of the primary waves of sound set in motion by the vibrations of the vocal cords, re-enforced by the vibrations set in play, secondarily, in the various cavities above. Of course, as we know, the column of air in any of the upper cavities is only set in play when its fundamental note is struck by the vocal sound issuing from the larynx.

Articulate speech is made up by a combination and modification of the elementary sounds, whose origin is largely in the larynx, yet not altogether, for, when we come to carefully analyze articulate speech, we find that it is only the vowel sounds which have their direct origin in the vibrations of the vocal cords, and that the consonants are formed by a modification or interruption of the expiratory blast, in the throat, mouth, and nasal cavity. While the only sounds which are produced by the vocal cords are the vowel sounds, the peculiar characteristic of each vowel sound is the result of the positions which the mouth, tongue, and lips assume, this being different for each vowel. Furthermore, Helmholz teaches

[1] "Die Lehre von den Tonempfindungen," Heidelberg, 1863.

us that the fundamental note of each vowel is invariable. In other words, that in the enunciation of each vowel sound the pharynx and mouth are placed in such a position that they form a cavity, whose fundamental note is exactly the same, for that vowel, in all races and in all individuals. Thus, the fundamental note of the oral cavity in the enunciation of *a* represents a tone produced by 945 vibrations in the second; that of *o*, 470; of *i*, 3,760; etc.

We have stated that the larynx has nothing to do with the utterance of consonant sounds. This is clearly understood, when we analyze each consonant-sound as either commencing or ending with a vowel sound, as for instance *b* or *p* terminates with the vowel sound *e*, while *m* or *n* commences with the same vowel.

Consonants are produced entirely in the oral cavity, by interruptions or modifications of the expiratory blast. Consonants may be divided into labials, dentals, and gutturals, according to the point in the oral cavity at which the interruption or modification of the expiratory blast occurs; and these may further be divided into explosives, aspirates, and resonants, according to the manner in which the expiratory blast is interrupted or modified.

By explosives we mean those in which the expiratory blast is suddenly interrupted or modified. Thus, in *p* and *b* the expiratory blast is suddenly interrupted at the lips; in *t* and *d* the expiratory blast is interrupted and suddenly relaxed, immediately behind the front teeth, by the action of the tongue and the roof of the mouth; in *g* hard and *k* the expiratory blast is interrupted by the root of the tongue being pressed against the hard palate, and suddenly relaxed. Of these, the sounds *p* and *k* are formed without the voice; the others with the voice.

In the aspirates, there is a gentle rush of air through a constriction in the mouth formed by the lips, or by the approximation of the tongue to the palate; in *f* and *v* this rush of air is interrupted by the lips; in *s*, *l*, and *z* the constriction is formed by the approximation of the tongue to the roof of the mouth. Of these, *f*, *s*, and *l* are done without the voice; in *v* and *z* the voice is used.

In the utterance of the resonants, the vocal waves are largely projected into the nasal chambers, thereby acquiring a certain resonant character. In these sounds, therefore, the palate is completely relaxed, and the palato-pharyngeal space kept widely open. In *m* the expiratory blast is arrested by the lips; in *n*, immediately behind the front teeth; in *ng*, by the pressure of the root of the tongue against the roof of the mouth.

The only remaining sound is that of *r*, which is usually spoken of as a vibratory consonant. This among Latin races is ordinarily produced by the vibrations of the tip of the tongue elevated

against the hard palate; while among the English-speaking peoples, it is more guttural, and is formed by the vibrations of the uvula or other portions of the pharyngeal wall, the tongue being approximated to the soft palate. The same law holds true in regard to the oral cavity in the utterance of consonants, as in the utterance of vowel sounds, viz., that its position in each represents a fundamental note, which is fixed and unchangeable for each consonant. This law only holds true with reference to the simple, self-sounding consonants.

In the formation of the whispering voice, the anterior portions of the vocal cords are in approximation, while posteriorly a triangular opening is left between the vocal processes, through which the outgoing current of air rushes with a slight sound, which is formed into articulate speech by the tongue, lips, etc. The whispering voice illustrates what has previously been said in regard to the fundamental note of the oral cavity in vocal sounds, in that the pitch of the whisper is always the same for each vowel, and cannot be changed, and therefore represents the fundamental note of the oral cavity in each instance.

Articulate speech, therefore, as far as the upper air passages are concerned, simply requires the integrity of innervation, motility, and contour of the larynx, pharynx, nasal and oral cavities, and lips. As we have seen above, the tongue plays an exceedingly important part in the enunciation of most of the consonant sounds, and yet Bateman[1] speaks of it as playing only a subordinate part, in that many cases have been reported in which the power of articulation was not seriously impaired after extirpation of the tongue.

In more or less complete destruction of the soft palate and uvula, or in obliteration of the palato-pharyngeal space, the tone of the voice is seriously modified, and yet articulation is not materially interfered with. In the loss of the palate or in cleft palate, the difficulty is not so much in the movements of articulation as in the fact that the air escapes through the nasal passages, the patient not being able to force sufficient between the lips for use in articulation. The lips, therefore, are the parts most markedly brought into use in the process of articulation, and hence anything which interferes with their motility more seriously hampers this faculty than a morbid condition of any of the other parts involved in the function.

THE SINGING VOICE.—We thus find ordinary phonation accomplished by an exceedingly simple mechanism, and that the method by which articulate speech is formed does not call upon the larynx for the exercise of anything more than its ordinary

[1] "On Aphasia," London, 1890, p. 163.

powers. The ordinary conversational voice, therefore, does not demand that the larynx and upper air passages shall be in a perfectly normal state; indeed, we find this organ not infrequently the seat of notable morbid lesion, without impairing the conversational voice.

The higher powers of the larynx are only called forth in the production of the singing voice: in singers, therefore, it becomes absolutely essential that the larynx shall be perfectly normal in every respect. In the use of the singing voice, furthermore, we have clearly demonstrated the close relation which exists between the parts which make up the whole of the upper air tract, in that it is not only essential that the larynx shall be normal in contour, properly innervated, and free from any inflammatory process, but that the whole upper air tract also shall be in a state of health.

The mechanism by which the singing voice is produced has been a subject of speculative study ever since music took its place among the arts. Garcia's discovery of the laryngoscope of course gave renewed impulse to the study of this subject, based on the exact information obtained therefrom. While the laryngoscope has given us exact information as regards the movements of the larynx in the production of the voice, I think we must acknowledge that as regards the investigation of the singing voice, it has been something of a disappointment, in that it is by no means easy to thoroughly inspect the larynx by means of the laryngeal mirror, in the act of singing, its mere presence in the fauces hampering and interfering with the normally free movements of the parts which the production of the high notes especially demands.

Probably every healthy larynx possesses the capacity for singing: from a conventional point of view, however, we say that an individual possesses a singing voice who possesses the capacity of producing, by means of the larynx, the successive tones of the musical scale in such a manner as to afford an agreeable and harmonious impression to the ear. This faculty is not the natural endowment of the larynx, but one which is only acquired by practice or exercise. The idea of the singing voice, furthermore, involves the necessity of its possessing a certain range, usually in the neighborhood of two octaves.

The singing voice is practically the same in the male and female, and it is so estimated in the preparation of written music; although in singing the same score, the female takes a note an octave higher than the male. In childhood, the male and female voices are the same, the larynx being smaller and the muscles somewhat weaker than in adult life. The voice at this age possesses tones of unusual sweetness and clearness, which are capable

of a considerable degree of cultivation. This voice is usually called the treble voice, and is made much use of, especially in our church service. This is usually conducted by boy choirs, in that the boy treble seems much more available than the girl. This treble quality in the voice can be preserved by castration, an operation which it is said was largely resorted to, in former times, in maintaining a supply of treble voices for the service in European churches. At puberty, a notable change takes place in the male, in that this sweet treble quality of the voice is entirely lost, and it takes on a new character, which bears no special relation to its character before puberty. This has been especially shown by the fact that in a number of cases a treble voice in a boy, which was famous, not only disappeared completely at puberty, but the new voice which developed possessed no notable value in singing. This change in the voice at puberty is merely the result of the rapid development which takes place at that time, the larynx in the male increasing to about double its former size, in a comparatively short period. In the female there is no change in the quality of the voice at puberty, although it gains a certain amount of vigor and range. There is, however, notable development at puberty, the larynx increasing about one-third in size.

The musical scale is usually estimated as embracing from seven to seven and a half octaves, beginning with C_{-1}, which is regarded as the lowest musical tone which can be recognized by the ear. This note is produced by thirty-two vibrations per second, while the highest note which has been recognized is C_{10}, eleven octaves higher, which represents 33,768 vibrations per second. The highest note, however, which the singing voice has ever been known to produce is probably that of Lucretia Ajugari, who reached C_6, a note which represents 2,048 vibrations to the second; while the lowest note which has ever been taken by the larynx is probably that of Myron Whitney, who took E_{-1} in an improvised cadenza while singing "Why do the nations," etc., in the "The Messiah," the note not being in the original score.

The male voice not only differs from the female voice in pitch, but we find individual voices possessing notable difference in pitch and range, both among males and females; thus, in the female voice we have the soprano, mezzo-soprano, and contralto, while in the male voice we have the tenor, baritone, and bass. These voices differ mainly in regard to range and pitch, although I think we all recognize an additional difference in the quality of the voice: this, however, is not a matter of importance.

Commencing at the lowest note, an average bass voice is one which ranges from F_1 to D_3; a baritone ranges from A_1 to F_3;

a tenor register is from C_2 to A_3; a contralto register is from E_2 to C_4; a mezzo-soprano from G_2 to E_4; a soprano from B_2 to G_4.

We thus find the range of the average singing voice about two octaves; in many instances, however, this is very notably exceeded: thus, Parepa-Rosa had a range of three octaves, from G_2 to G_5, while Ajugari sang from G_2 to C_6; Farinelli, a eunuch, sang from A_1 to D_5; Cessi, a contralto, sang from C_2 to F_5; Forster, from F_1 to A_3.

The mechanism by which the notes are produced is practically the same both in the male and female, and also in the different varieties of voices, such as tenor, contralto, etc.

The singing voice divides itself naturally into three registers, according to the position which the larynx and vocal cords assume in the production of the tones. These have been named the chest register, the middle or falsetto register, and the head register, owing to the fact that, to the ear, the notes of these various registers seem to proceed respectively from the chest, the oral cavity, and the resonant cavities of the head; or more properly speaking, to be re-enforced by the overtones belonging to these various parts. This division is somewhat misleading, and we adopt in preference the classification of Browne and Behnke,[1] who describe these registers as: a thick register, corresponding to the chest register; a thin register, corresponding to the falsetto or middle register; and a small register, corresponding to the head register; these names more accurately describing the position which the vocal cords assume in the production of tones which belong to these various registers.

The Thick or Chest Register.—This register belongs more particularly to the male voice, and is the one, moreover, to which the ordinary conversational voice belongs. It is also largely made use of in the contralto voice in the female.

The tones produced in this register are usually the lower notes of the singing voice. As we have already seen, the lowest appreciable musical tone is C_{-1}, which represents thirty-two vibrations to the second; while the lowest note which has been formed by the human larynx was that taken by Myron Whitney, E_{-1}.

In the formation of the lowest notes in the register, the larynx is held in a fixed position by the action of the sterno-thyroid and thyro-hyoid muscles, while the arytenoid cartilages are brought into apposition by the inter-arytenoid muscle. The chink of the glottis thus becomes an elliptical opening, and the note is produced probably by vibrations of the whole of the vocal bands (see

[1] Op. cit., p. 163.

Fig. 49). As we ascend the scale, the increased tension required is secured by the action of the lateral crico-arytenoids, which rotate the vocal process inward, thus approximating the cords. As soon as the vocal processes are brought into contact, further tension in this manner becomes impossible. The chink of the glottis now represents an elliptical opening, extending from the vocal processes to the receding angle of the thyroid. A new force now comes into play to increase the tension of the cords, in the contraction of the crico-thyroid muscle, which draws the cricoid cartilage up under the thyroid, thus stretching the vocal cords. As the singer goes up the scale, the tension accomplished in this manner increases, bringing the cords more closely into parallelism, until the chink of the glottis presents a linear opening (see Fig. 50).

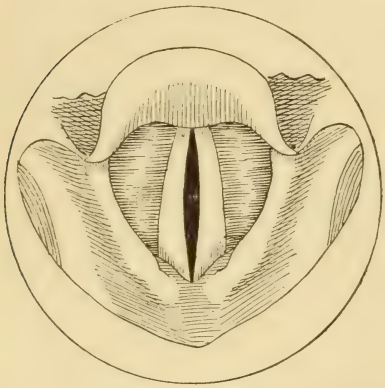

Fig. 49.—Laryngoscopic Image during the Production of Notes in the Lower Thick Register.

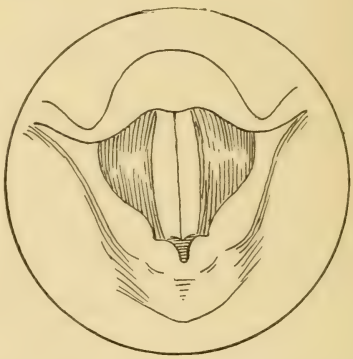

Fig. 50.—Laryngoscopic Image during the Production of Notes in the Upper Thick Register.

This marks the limit of the chest or thick register. This term, therefore, we use as embracing all those notes of the singing voice which are produced while the larynx and vocal cords are in this position.

In the production of the low notes, the epiglottis overhangs the larynx, in such a way as to shut off the view of a large portion of the vocal cords. As the higher notes are struck, the epiglottis gradually rises, until, when the highest note of this register is taken, the epiglottis is so far elevated as to admit of a view of the vocal cords in almost their entire extent. This movement of the epiglottis is probably dependent upon the contraction of the thyro-hyoid muscles.

Mme. Seiler, Browne and Behnke, and others divide this chest register into two series of tones, the lower ones being produced by the whole length of the cord, and the higher ones merely by that portion of the cord anterior to the vocal processes. The

distinction is important mainly with reference to muscular action, as it is not perceptible to the ear.

The Thin or Middle Register.—The series of tones which belong to this register are produced almost entirely by the action of the thyro-arytenoid muscle, which, as we see, comes into play now for the first time. They are, moreover, the result of vibrations confined mainly to the thin edge of the vocal cord, and not of its whole width, as was the case in the thick or chest register.

At the termination of the chest register below, we left the chink of the glottis represented by a linear opening, formed by the stretching of the cords under the action of the crico-thyroid muscle. The thyro-arytenoid muscle, which, as we know, is attached in the whole length of the vocal cord, coming into play, apparently draws outward the cord, still held tense by the crico-thyroid muscle, thus increasing its tension.

According to Müller, in this register the ventricular bands press down upon the vocal cords, in such a way as to prevent their vibrating except at the edge. This, however, is more likely due to the action of the thyro-arytenoid muscle drawing the cord outward, and thus thinning the vocal band (see Fig. 51). We have here apparently the most striking change in the mechanism of the larynx that occurs in the whole gamut, in that going from the upper note of the thick or chest register to the lowest note in the middle register, the increased vibrations are not so much the result of increased tension as that the thickness of the vibrating cord is reduced from the whole breadth of the vocal band to its narrow edge, the result of which is that a high note, the result of rapid vibrations, is produced with much less muscular effort than was necessary where the whole width of the vocal band was thrown into vibration. In passing from the lower register to this register, singers always experience a sense of notable relief. This is probably due very largely to the fact that the anterior fibres of the crico-thyroid muscle, on this change, become relaxed, as is shown by the fact that the crico-thyroid space at this time resumes its normal dimensions, as can be determined by digital examination. The antero-posterior tension of the cords, however, is still maintained. This is accomplished by the action of the thyro-hyoid muscle, in connection with that of the posterior fibres of the crico-thyroid. The main sense of relief, however, undoubtedly is in the fact that the muscular effort necessary for the production of these high notes is only such as is required to throw the small, narrow edge of the cord into vibration, in place of that which is necessary for throwing the whole breadth of the vocal band into action.

The change in the character of the tone is easily appreciated

by the ear, in that, while the tone is one which is diminished greatly in volume, it gains in sweetness, and takes on a flute-like character, which is most agreeable to the ear. The successive notes in the scale are now produced by increasing the tension of this thinned vocal cord, by the combined action of the thyro-arytenoid and crico-thyroid muscles, the anterior fibres of this latter muscle gradually coming into play, as is shown by the fact that, as the higher notes are produced, the crico-thyroid space is again slowly obliterated.

When the capacity for antero-posterior extension under the action of the crico-thyroid has reached its limit, we have a still further mechanism shown in the production of the higher notes of this register, in that the anterior fibres of the crico-thyroid again

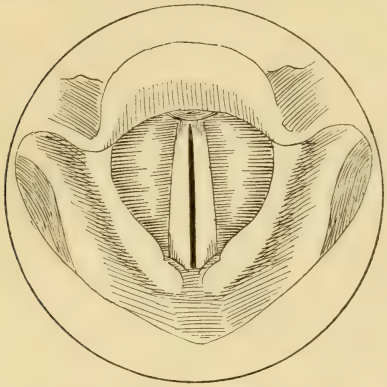

FIG. 51.—Laryngoscopic Image during the Production of Notes in the Lower Thin Register.

FIG. 52.—Laryngoscopic Image during the Production of Notes in the Upper Thin Register.

relax, and the chink of the glottis, which hitherto has remained a linear opening, assumes an elliptical form; for if we examine the larynx during the production of the successive tones of this register, we find that the chink of the glottis remains a linear opening until the higher notes are reached, when it somewhat abruptly assumes an elliptical shape (see Fig. 52); and the still further tension for production of the higher notes is provided by the contraction of the thyro-arytenoid muscle, and also of the crico-thyroid, which again comes into play.

There would seem to be some alternating or compensating action in these two muscles, one resting the other, as it were. This is especially noticeable as we ascend the scale, when their highest capacity is called into play.

Behnke and Browne divide this register into two, the upper and lower thin, the point of division being at that note where the sudden relaxation of the crico-thyroid occurs and the glottis as-

sumes an elliptical shape. The same writers instance cases where singers have sung the whole register with an elliptical glottis, viz., apparently trying to sing without the action of the crico-thyroid muscle, the result being not only detrimental to the larynx, but also to the quality of the voice.

During the production of the notes of this register, the opening of the larynx is narrowed by the contraction of the ary-epiglottic muscles, the ventricular bands are brought closer together, and the larynx is raised higher in the throat, under the action of the thyro-hyoid, and probably also of the palato-pharyngeus and constrictor muscles of the pharynx. At the same time the palato-pharyngeal opening is narrowed, and the whole contour of the upper air tract is such as to propel the notes mainly into the oral cavity, thus giving to the notes of this register the peculiar character which has led to its being called the middle register, the nasal resonance being shut off by closing the pharyngeal opening, while at the same time the chest resonance is absent.

This register belongs both to the male and female voices, but is especially characteristic of the soprano and tenor voices, and certain notes of the contralto.

The small or head register is that which embraces the higher notes of the singing voice. In the production of the higher notes of the middle register, we described the anterior portion of the cords as forming an ellipse, which was greatly narrowed by the antero-posterior tensor action of the crico-thyroid muscle, and made more tense by the action of the thyro-arytenoids. When the higher notes of this middle register are reached, the limit of tension seems to be attained by this mechanism, and the further increase of the number of vibrations of the cords for the production of the notes which belong to the head register is secured by a progressive shortening of the length of the vibrating membrane. This is accomplished by the thyro-arytenoid muscles, which bring the edges of the cord at the posterior portion of the ellipse into apposition, the extent of this contact being gradually increased as the higher notes are produced, until, when the upper portion of this register is reached, we have practically only about the anterior third of the vocal cords brought into play (see Fig. 53). The tension of the cords in this register is secured by the action of the

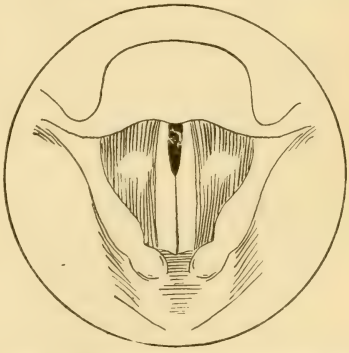

FIG. 53.—Laryngoscopic Image during the Production of Notes in the Falsetto or Small Register.

crico-thyroid and thyro-arytenoid muscles, and probably does not vary greatly with the production of the successive notes, the increased pitch being secured purely by the shortening of the vibrating ligament. The manner by which this progressive shortening of the vibrating cord is secured by the action of the thyro-arytenoid muscle was always somewhat obscure, until Mme. Seiler demonstrated the existence of a small elongated fibro-cartilage imbedded in the vocal cord, and extending, from the tip of the vocal process of the arytenoid, as far as the middle of the glottis. This is acted upon by the internal thyro-arytenoid muscle in such a way as to secure the closure of the posterior portion of the chink of the glottis. As we have already learned in the production of that series of notes which belongs to the middle register, the palate is drawn up toward the pharynx, so as to largely shut off the naso-pharynx and nasal chambers. As, however, we get into the notes which belong to the upper register, we find the palate drawn down in such a manner as to open the palato-pharyngeal space; in this manner the voice becomes largely re-enforced by the resonance of these cavities above. The peculiar quality thus given is easily recognized by the ear, but more particularly is appreciated by the singer, and it is this probably which gives it its ordinary name of the head register.

The middle register is common to the male and female voice; the head register belongs more particularly to the female, although largely used in the boy treble.

We thus find the mechanism by which the notes are produced in the three registers notably dissimilar, from which it might be inferred that the passage from one register to another was accompanied by perceptible changes; and yet it is characteristic of a well-trained voice that these changes should be made easily, and in such a manner as to be imperceptible to the ear.

As we have learned above, the division of the singing voice into registers is based purely on anatomical grounds: the deduction has been drawn from this that these registers in each individual bear a distinct relation to the chromatic scale; as for instance, we are taught that in all cases the change from the lower to the middle register occurs between F and G in the treble clef, and that the change from the middle to the head register occurs exactly one octave higher, viz., between the F of the treble clef and the G in alto. This is undoubtedly true in the majority of singers, and yet I think it is questionable if this teaching must be accepted in all cases, in that in many individuals this change from the lower to the middle or from the middle to the upper register is made with more ease and with the result of producing a better note if made

a tone above or below this fixed point: in other words, I think that this is a matter to be regulated by the ear, rather than by any question of anatomy, and that the change should be made at such a point as will result in the production of the best tone. I have seen voices much injured by forcing a note into the wrong register. A well-trained singer generally knows in which register to place a note, by his or her sensations in the effort to produce it.

The finer points with reference to the singing voice, such as the definite position of the lips, tongue, palate, etc., in the production of the different notes, together with the action of the expiratory muscles and the management of the breath, are not entered upon here, in that they belong more particularly to the technical works on voice culture.

Ganglionic Cells which Preside Over the Motor Innervation of the Larynx.—The ganglia which preside over the motor innervation of the larynx are situated, as we know, in the floor of the fourth ventricle. These ganglia, moreover, preside over all the movements which take place in the larynx, both voluntary and involuntary. A number of investigators go further than this, and claim to have demonstrated by physiological experiment the existence of a centre of laryngeal innervation in the cortex of the hemispheres. These experiments, I think, cannot as yet be regarded as conclusive. I am disposed to think that an element of confusion may have entered into the consideration of this subject, in that, whereas the centre of speech has been definitely located in the cerebral cortex, it seemed plausible that a motor centre might also be traced to this region. In this connection it may not be uninteresting to briefly trace the development of these teachings. As far back as 1825, Bouillaud located the faculty of articulation in the frontal lobes of the brain, basing his conclusion on the fact that articulate speech was impaired in 114 cases which he had collected of brain disease affecting these lobes. Audral subsequently collated a series of cases in which this faculty was impaired in connection with disease of the middle and posterior lobes of the brain. Still later, the investigations of Dax showed that impairment of speech was associated with disease of the left side of the brain. The son of this writer still further limited the cerebral lesion to the anterior and external parts of the middle lobe. In 1861 Broca[1] propounded his famous theory that the centre of articulate speech was located in the posterior part of the third frontal convolution of the left hemisphere of the brain, basing this teaching on the study of two cases, one of softening of the brain, and the other of cerebral hemorrhage. This theory has received such ample con-

[1] Bull. de la Soc. anat. de Paris, 1861.

firmation since Broca's first publication that it is generally accepted, although the area of the speech centre has been somewhat extended so as to include the insula and the extra-ventricular nucleus. While, therefore, this portion of the brain was found to preside over the faculty of speech, as shown by the large number of instances in which an aphasia was the result of brain disease affecting Broca's convolution, in no one of these cases does there seem to have resulted from the cerebral lesion any impairment of motion of the laryngeal muscles.

One of the earliest to suggest a cerebral motor centre was Krause,[1] who based this view on a series of experiments on dogs. His first experiments consisted in removing a portion of the skull and irritating the surface of the brain near Broca's convolution, producing in every instance muscular movements of the larynx. He then extirpated a considerable portion of the cortex in this region, subsequently closed the wound, and allowed the parts to heal. This resulted in permanent destruction of the power of barking. The respiratory movements of the larynx were not destroyed in Krause's experiments, and these, as we know, are involuntary, and are only dependent on the integrity of the respiratory centre in the medulla. Phonation was destroyed in the dogs, not because the motor centre of the larynx was destroyed, but because the psychical centre, which is absolutely necessary for setting in play the voluntary movements of the larynx, was destroyed. Phonation is not reflex, but an act which is only brought into exercise by a psychical impulse, and therefore can only be accomplished when that portion of the brain which presides over this action is intact. Following the publication of Krause's experiments, Delavan[2] reported two cases which seemed somewhat to support Krause's theory; one of them was a case of left hemiplegia, with notable impairment of articulation. No laryngoscopic examination was made during life, but a post-mortem examination showed Broca's convolution invaded by a blood clot. The medulla was not examined. His second case was one of left hemiplegia, with complete abductor paralysis of the left vocal cord; there was at the same time difficulty in deglutition and impaired articulation. This latter case seemed to curiously sustain Delavan's claim of a cerebral motor centre; upon the death of this patient, however, an autopsy was made, which the observer promptly reported.[3] The hemiplegia was found to be due to an extensive endarteritis, in-

[1] Arch. für Anat. und Physiologie: Phys. Abtheil., 1884.

[2] Trans. Eighth Internat. Congress, Section of Laryngology, p. 17. N. Y. Med. Record, vol. xxvii., p. 178.

[3] Trans. Amer. Laryngological Ass'n, 1888, p. 195.

volving the arteries supplying the brain, while the laryngeal paralysis and the difficulty in deglutition were found to be dependent upon a softening involving the floor of the fourth ventricle, the result also of an endarteritis. The existence of these two lesions, with their resultant symptoms, is a somewhat curious coincidence, and the clinical history of the case might easily justify Delavan's conclusions, and yet Broca's convolution does not seem to have been involved in the morbid process of the brain, and the apparently aphasic symptoms were the result of the bulbar disease. Following the same line of investigation, Semon and Horsely[1] made a series of physiological experiments on the lower animals. These were of a character somewhat similar to those of Krause, and they reached the same conclusions. The fallacy of this deduction has already been pointed out. The results of experiments by Masini[2] must also be rejected on the same ground.

[1] Lancet, London, May 29th, 1886. [2] Arch. Ital. di Laryngol., April, 1888.

CHAPTER XXVII.

LARYNGOSCOPY.

THE optical principles involved in laryngoscopy, together with the various appliances, such as the laryngoscope, head mirrors, throat mirrors, the use of the fixed light, sunlight, etc., have already been described in the previous volume in discussing the subject of posterior rhinoscopy.

In making an examination of the larynx, the same general principles apply here as in rhinoscopy, both in the management of the light and the use of reflectors, as also in the position of the patient. The only difference between the laryngeal mirror and the rhinoscopic mirror is in its size, and the angle at which the mirror is joined to the shaft. For laryngeal examination, it is well to make use of the number 4 or 5 mirror, and one in which the shaft is fixed to the reflecting disc at an angle of from 120° to 125°. The mirror is first warmed over the light, to prevent the moisture of the breath from condensing upon it and thus obscuring the image. Before its introduction, it should be touched to the cheek or the hand, to test its temperature, thus avoiding its use while too hot. The tongue of the patient should be protruded, and seized between the thumb and forefinger of the left hand, a napkin being interposed, and drawn gently forward and down over the lower lip. If preferred, this may be done by the patient himself, who should make use of the right hand. The shaft of the mirror should be held easily and gently in the hand, as one holds a pen. With its reflecting surface downward, and parallel with the dorsum of the tongue, and the shaft held away from the median line in such a position that it will strike the angle of the mouth, the mirror is passed backward until its edge touches the soft palate. It is then slightly inclined, and passed downward and backward, until the uvula rests on its posterior surface, when without changing its inclination it is carried backward and upward by a quick movement, lifting the uvula and soft palate with it, until it rests firmly against the wall of the pharynx. When in position, it should rest transversely in the fauces, and be inclined at an angle of 45°. The patient should now be directed to sound a high pitched "A" or

"ah," as by this note the base of the tongue is depressed, the epiglottis lifted, and the laryngeal cavity brought well into view. In pressing the mirror against the pharynx, it is well to press with a firm hand, as there is less danger of causing retching in this manner than if the mirror is held free from the pharyngeal wall and unsteadily. The lower edge of the mirror should rest on the wall of the pharynx at a point above the free edge of the palate; in other words, in the lower portion of the naso-pharynx, as this part

FIG. 54.—Method of Making a Laryngoscopic Examination.

is less sensitive than the oro-pharynx, and therefore retching is less liable to occur. By reference to Fig. 55, the relative position of the parts and the position in which the mirror should be held will be easily understood, as well as the course of the illuminating and visual rays. Commencing at the light, the rays fall successively upon the reflecting mirror of the laryngoscope, from whence they are converged on the laryngeal mirror in the fauces, from which they are reflected upon and illuminate the laryngeal cavity. Re-

turning now as visual rays, they travel back from the larynx to the laryngeal mirror, and are then deflected to the eye. This diagram also illustrates the importance of making use of the small central aperture in the reflecting mirror for making the examination, as in this manner the illuminating and visual rays fall in the same line: for instance, while the illuminating rays pass through the dotted lines shown, and illuminate that portion of the laryngeal cavity upon which they directly impinge, were the eye placed beyond the edge of the reflecting mirror, the visual rays are liable to be reflected by the throat mirror on a portion of the larynx not fully illuminated. The habit so often practised, therefore, of placing the head mirror on the forehead and looking beneath it is one to be avoided.

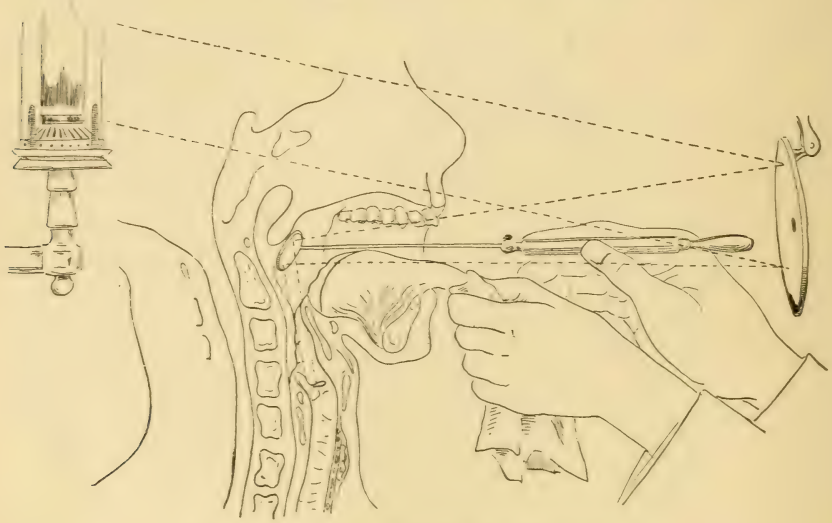

FIG. 55.—Diagram showing the Principle of Laryngoscopy.

The epiglottis is occasionally found so far overhanging the laryngeal cavity as to seriously interfere with the examination. To overcome this difficulty, various forms of hooks and pincettes have been devised. I have rarely met with a case where these instruments were tolerated; on the other hand, I have rarely met with a case in which this difficulty was not overcome, and a satisfactory view of the parts obtained by the exercise of a little patience. As a rule, an overhanging epiglottis is the result of muscular contraction, and disappears as the patient becomes accustomed to the manipulation. The enunciation of a high note aids somewhat in lifting the epiglottis and overcoming the difficulty. The throwing of the head of the patient well backward also tends to open the laryngeal cavity. Irritability of the throat is probably the most obstinate and trying of all the difficulties encountered in

making a laryngoscopic examination. We occasionally meet with patients in whom the mere opening of the mouth causes retching. In these cases, nothing perhaps avails better than the application to the pharynx of a ten or twenty per cent solution of cocaine.

Gottstein[1] thinks this is rarely necessary or advisable. I have successfully resorted to this device so many times that I am confident of its value; and yet I think it should not be resorted to unless necessary, in that the application of cocaine always results in temporary inconvenience and discomfort to the patient. Much aid is often gained by simply directing a patient with an irritable throat to take short, quick respirations, the cool air striking the fauces, seeming to cause a certain amount of local anæsthesia. Occasionally in young children I have often persisted in the examination, in spite of retching, the momentary opening of the larynx which accompanies the act of retching giving a fairly satisfactory, although but brief, inspection of the cavity. The best success in the laryngoscopic examination of a patient with an irritable throat is obtained, I think, by the exercise of patience and by a certain deftness and delicacy of manipulation, which is acquired with practice. Retching, I take it, is merely the involuntary effort at deglutition, excited by the presence of a foreign body in the food tract; the laryngeal mirror in this case being the foreign body: the rule, therefore, already suggested, should be kept in mind, viz., that of pressing the palate well up, in order that the mirror may rest upon the walls of the naso-pharynx, rather than of the oro-pharynx, as in this position retching is less liable to occur. A thick or unruly tongue may at times interfere with the observation, by obtruding itself, or arching itself up in the line of vision. In such cases, resource must necessarily be had in the use of the tongue depressor, the examination being made without protruding the tongue. This is an excellent method for examining the larynx, and one which may well be resorted to much more frequently than it is. If the fauces are narrowed by large tonsils, this simply requires the use of a smaller mirror. An elongated uvula need not interfere with an examination, other than in rendering the fauces irritable. In such a case this organ can be easily caught on the back of the mirror and lifted out of the way.

It is well to say that in making an examination the mirror should not be held in place more than from five to ten seconds, especially with patients not trained to tolerance of it, as a much more satisfactory examination will be accomplished by avoiding the wearying of the patient, and the danger of exciting retching, by too long an examination. After the mirror has been placed in

[1] "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 31.

position, it should be held firmly against the pharynx, and not moved about in search of the proper position and inclination for a view of the laryngeal cavity, as in this manner retching will be immediately excited. If it is desired to change the angle of inclination in order to bring into view the anterior or posterior portions of the larynx, this is easily accomplished by simply turning the handle of the mirror between the fingers, thus changing the inclination of the reflecting disc without moving its position.

The Laryngeal Image (see Figs. 56 and 57).—We are usually taught that, in making an examination of the larynx, the image which is reflected upon the mirror is reversed. This may be quite true, and yet I think it is well, at the outset, to divest ourselves of this teaching, in that it is somewhat misleading. The reversal of the image is simply the same that takes place when one looks in an

FIG. 56.—The Laryngoscopic Image during Respiration.

FIG. 57.—The Laryngoscopic Image during Phonation.

ordinary dressing-mirror, and I take it that in making a laryngoscopic examination it is no more necessary to bear in mind that the image is reversed than it is when making one's toilet before a dressing-glass. Anatomy teaches the general relation of the individual parts of the larynx to each other, and hence it is well for those commencing the practice of laryngoscopy to make themselves thoroughly familiar with the regional anatomy of the parts. It will be found of incalculable assistance to the beginner, before practising on living subjects, to secure a larynx from the dead subject, supporting it by a proper framework, and to trace the parts, with the assistance of a good description of the laryngoscopic image. Tobold[1] suggests placing the fresh larynx *in situ* in a dry skull, for this purpose. A wide-mouthed bottle answers an equally good purpose.

[1] "Laryngoscopie und Kehlkopf Krankheiten," Berlin, 1874, p. 50.

Having placed the mirror in the proper position in the fauces, for an examination of the living subject, the first object that will be noticed is the epiglottis, standing up prominently in the upper portion of the mirror. It is of a pinkish-yellow color, the cartilage showing through the mucous membrane at its crest and borders. The upper border is of a somewhat crescentic shape, more or less curved upon itself, and presenting great variations in contour in different individuals, as has already been noticed. It may be seen in different positions, varying from a fully erect one, in which the laryngeal cavity is thoroughly exposed to view, to one in which it overhangs and largely conceals the cavity. If the anterior or lingual surface of the epiglottis is brought into view, there will be noticed three folds of mucous membrane passing from the epiglottis to the base of the tongue, one in the median line, the glosso-epiglottic ligament, dividing the depression between the epiglottis and the base of the tongue into two fossæ, the lingual or glosso-epiglottic fossæ. On the outer side of these fossæ are seen slight folds of mucous membrane, which are sometimes designated as the lateral glosso-epiglottic ligaments, although they contain no ligamentous tissue. These fossæ occasionally afford lodgement for particles of food and other substances, and should always be inspected, in searching for foreign bodies in the throat. The posterior or laryngeal face of the epiglottis, just below the cavity of the larynx, is marked at about its centre by a rounded, pad-like prominence, of a deep red color. This is formed by the petiolus of the epiglottis, and is usually designated as the cushion of the epiglottis.

There will next be noticed two folds of membrane, passing downward and backward, one from each side of the epiglottis, to the arytenoid cartilages, two small, rounded, knob-like prominences in the lower part of the image, which in the living subject are seen moving from a state of close proximity to one of wide separation, in the acts of respiration and phonation. These folds of membrane are the aryteno-epiglottic folds, or as they are usually termed, the ary-epiglottic folds. They form the lateral walls of the laryngeal cavity, separating it on either side from the pyriform sinuses. In the posterior portion of middle third of each fold will be noticed a small, knob-like projection, which is formed by the cartilage of Wrisberg, and further down a second rounded projection formed by the cartilage of Santorini, which, however, surmounting the arytenoid cartilage, simply serves to render it slightly more prominent, but, as a rule, cannot be distinguished from it.

Passing from one arytenoid cartilage to the other, and showing a slight depression or notch between them, especially noticeable when the cartilages are in approximation, will be seen a fold of

membrane, the arytenoid commissure, which completes the circuit of the lumen of the larynx as follows: The epiglottis in front, the ary-epiglottic folds showing the cartilages of Wrisberg and Santorini forming the lateral wall, and the arytenoid cartilages and commissure posteriorly. Immediately behind this commissure will be noticed a closed fissure, between it and the wall of the pharynx, which is the orifice of the œsophagus.

Going back now to the ary-epiglottic folds, there will be noticed on the outer side of each a somewhat pyramidal shaped cavity, the pyriform sinuses. These sinuses are bounded by the inner wall of the thyroid cartilages externally, the outer face of the ary-epiglottic folds internally, and the posterior wall of the pharynx posteriorly, where they approximate one to the other and pass down into the œsophagus behind the arytenoids. At the bottom of each sinus may be seen or felt a projection formed by the superior cornu of the hyoid bone. Mackenzie[1] speaks of these sinuses as external to the larynx. Practically the matter is not an important one, yet, anatomically, it seems to me, they form an intrinsic portion of the larynx, lying as they do within the thyroid cartilages. These cavities afford a favorite site for the lodgement of fish-bones, particles of food, or other substances, and should be carefully searched in looking for foreign bodies.

Passing again to the interior of the larynx, the first object noticed below the ary-epiglottic folds are the two ventricular bands or, as they are sometimes improperly called, the false cords. These are two folds of mucous membrane, one on either side, which pass from the receding angle of the thyroid cartilage anteriorly where they are nearly in apposition, to the arytenoid cartilages posteriorly. They are somewhat rounded, prominent folds of mucous membrane, supported by the thyro-arytenoid ligaments, and presenting a deeper red color than the other portions of the laryngeal cavity. They move with the arytenoids, and are parallel with the vocal cords. Immediately below the border of the ventricular bands is seen a dark line, which separates them from the true vocal cords below. This line or fissure marks the entrance of the ventricles of the larynx. Immediately below the ventricles, we come upon the true vocal cords, two white, glistening bands, moving back and forth with the acts of phonation and respiration. Their color is due to the fibrous tissue of which they are composed showing through the mucous membrane which covers them, this latter being extremely thin and supplied very sparsely with blood-vessels. The space of opening between the vocal cords forms the rima glottidis. When in apposition, the rima is merely a straight line

[1] "Diseases of the Throat and Nose," Am. ed., 1880, vol. i., p. 246.

extending from the receding angle of the thyroid cartilages to the arytenoid commissure. When the cords recede from one another and are relaxed, a little, knob-like projection is seen immediately in front of the arytenoid cartilage, and about one-fifth to a fourth of the distance between it and the receding angle of the thyroid. This is formed by the cartilaginous prolongation of the anterior angle of the base of the arytenoid, viz., the vocal process. During the act of phonation, the cords are brought into close approximation, and in this manner any inspection of the parts below is prevented. During the act of inspiration, however, the cords are widely separated, and, if the mirror is properly adjusted and the illuminating ray sufficiently powerful, the subglottic portion of the larynx and the rings of the trachea may be brought under inspection, and in favorable cases, the bifurcation of the trachea may be observed, with the opening into the right bronchus. The position of the mirror in the fauces being, as a rule, posterior to the axis of the trachea, its anterior wall is brought into view, with its rings, surmounted by the cricoid cartilage. If it is desired to inspect the posterior wall of the trachea, this is only accomplished by bringing the laryngeal mirror slightly forward in the fauces. Even a moderately overhanging epiglottis will ordinarily interfere with the success of this manipulation. Where such an inspection becomes important two mirrors may be used, as suggested by Schroetter.[1]

The general appearances of the normal larynx, with the color of the healthy mucous membrane, require no lengthy description. The existence of any departure from health is determined by the same tests to which any mucous membrane is subjected which can be seen by direct ocular inspection. In general, it may be said that the lining membrane of the larynx is of a light rose-pink color, with a tendency to yellowish tinge, especially where the cartilages are seen through on the surface, as at the crest of the epiglottis, on its sides, at the prominences made by the cartilages of Wrisberg and Santorini, and on the anterior wall of the trachea where the rings are manifest. At all these points the membrane is of a light pinkish-yellow color. Again, where the membrane covers a mass of glands, lymphatics, or loose connective tissue, it is of a deeper red color. This is noticeable on the cushion of the epiglottis, the epiglottic folds, the arytenoid commissure, and the ventricular bands.

In making a laryngoscopic examination, the first thing to observe is the general appearance of the mucous membrane, to determine whether it is discolored in any way, or whether it shows evidences of any of the forms of inflammatory action. The general

[1] "Vorlesungen über die Krankheiten des Kehlkopfes," Vienna, 1887, p. 35.

contour of the laryngeal cavity should then be inspected, to ascertain the existence of neoplasms, or whether there may be loss of tissue from ulceration or any destructive process; and finally, the movements of the cords, both in phonation and respiration, should be examined, to determine whether they are perfectly approximated in the median line, and the readiness with which they are abducted in inspiration, and, furthermore, whether their movements on both sides are perfectly symmetrical. In determining this latter point, it should always be borne in mind that the epiglottis is not infrequently deflected to one side or the other. Ordinarily, in making a laryngoscopic examination we bring the centre of the epiglottis into alignment with the arytenoid commissure. If, however, the epiglottis is deflected to one side, an alignment of this kind will so far distort the image of the part below as to give, not infrequently, the impression of marked deficiency of movement, or even paralysis, of one side of the larynx. Hence one should acquire the habit of inspecting the lower portion of the laryngeal cavity, without reference to the epiglottis.

CHAPTER XXVIII.

ACUTE LARYNGITIS.

In former times this term was used to designate an acute inflammatory affection involving the mucous membrane of the larynx, which was marked by the occurrence of extensive swelling, usually of an œdematous nature, with notable interference with respiration; while to the mild form of inflammation of the mucous membrane lining the larynx, the term subacute laryngitis was given. The term subacute is always, I think, objectionable from its indefiniteness, hence a better classification, it seems to me, is to drop the word entirely, and to designate as an acute laryngitis that variety of the disease which was formerly described as subacute, while that form which is accompanied by extensive swelling of the parts we will consider in the chapter on phlegmonous laryngitis. The term acute laryngitis, then, is used to describe an inflammation of the mucous membrane lining the larynx, which is acute in character, and is accompanied by hyperæmia and a moderate swelling of the parts, but by a very limited increase of secretion.

The affection is not a serious one, in that the inflammatory process confines itself mainly to the mucosa proper, without involving the deeper tissues. This affection is not ordinarily of a serious character, and its principal interest lies in the fact that the voice is notably impaired, and perhaps lost, a symptom to which, in the minds of the laity, an undue gravity is almost invariably attached.

Etiology.—We are generally taught that a sore throat or an acute laryngitis is the result of an exposure to cold, and this undoubtedly is the immediate exciting cause of the attack in the large majority of instances, but underlying this, I think, almost invariably we shall find that there exists a mild chronic inflammation of the mucous membrane of the larynx, which, under the influence of an exposure, takes on an acute exacerbation. In other words, the chronic inflammation commences first, and recurrent attacks of the acute inflammation become a prominent symptom. This point I regard as a somewhat important one, but it has already been discussed in a previous chapter.[1] Furthermore, I am disposed

[1] Vol. i., p. 105.

to think that an inflammatory process in the larynx is very rarely, if ever, a primary affection, but is secondary to an inflammatory process involving some portion of the air tract above. This is either an obstructive lesion of the nasal cavity proper, or some morbid process in the naso-pharynx. The method by which disease of the nasal cavity may give rise to a morbid process in the mucous membrane lining the larynx, has already been fully discussed in the chapters on acute, atrophic, and hypertrophic rhinitis, nasal polypi, hypertrophy of the pharyngeal tonsil, and chronic naso-pharyngitis. In general, we may say that the method of development lies in an interference with the normal respiratory function of the nasal mucous membrane.

The chain of events, I take it, is as follows: As the result of a lesion of the upper air tract which interferes with the normal respiratory function of the turbinated tissues, the air in respiration which passes through the larynx is not properly moistened or cleansed, and hence becomes a source of irritation, as the result of which the larynx becomes the seat of a chronic inflammation, of which repeated attacks of acute laryngitis become a prominent symptom, as the result of exposure to cold, etc. Hypertrophy of the pharyngeal tonsil acts much in the same way, in interfering with normal respiration. Chronic naso-pharyngeal catarrh, with its accumulation of mucus in the fornix, and the constant effort at expelling it, seems also to tax the laryngeal membrane in such a way as to develop a mild chronic inflammatory process.

As we see, therefore, recurrent attacks of hoarseness, with loss of voice, should always call attention to the probable existence of some diseased condition above. While the affection, therefore, as a rule, develops upon a chronic laryngitis, which is secondary to the diseased condition above, we not infrequently find it occurring in connection with an acute exacerbation of an inflammatory process in the upper air passages. In other words, we have an acute laryngitis, occurring in connection with an acute naso-pharyngitis; also less frequently, in connection with an acute rhinitis. It may occur coincidently with these diseases, or may develop in the course of the attack.

It occurs at all ages. Before puberty, as a rule, we find it secondary to hypertrophy of the pharyngeal tonsil. During the second and third decades of life, it is more liable to occur in connection with some form of rhinitis, while in later years it is dependent upon, in most instances probably, a chronic naso-pharyngeal catarrh. Among the rarer causes of the disease are the inhalation of irritating vapors, such as chlorine, iodine, ammonia, sulphur, etc., or the breathing of a smoke-laden atmosphere, from tobacco,

wood, or coal. Over-taxing the voice in public speaking, singing, or shouting may also bring on an attack.

Men are more liable to attacks than women, simply from the fact that they are more exposed to colds and more frequently suffer from chronic catarrhal troubles. Any impairment of the general health, which weakens one's resisting power, necessarily involves an especial liability to colds.

It occurs at any age, although I think it is far more frequent in the later years of life. As we have already seen,[1] an exposure in early life most frequently results in a cold in the head, which soon shows a tendency to travel downward to the pharynx and larynx. In later life this disposition seems to be reversed, and the primary effect of the cold is to produce a laryngitis or tracheitis, which travels up, as it were, and terminates in a cold in the head.

The occurrence of an acute laryngitis at the onset, or during the course of an attack of measles, scarlet fever, diphtheria, typhus and typhoid fevers, is usually a somewhat unimportant incident, which involves no serious consequences. The graver complications in the larynx which occur in connection with the exanthemata are due to a perichondritis or chondritis, and not to a catarrhal inflammation of the mucous lining.

Mention should be made in this connection of the acute laryngitis which occasionally follows the administration of drugs, iodide of potassium being especially active in this direction. The laryngeal hyperæmia from such causes is almost invariably accompanied by a similar process in the nasal mucous membrane.

PATHOLOGY.—The changes which occur in the membrane consist primarily in a dilatation of the blood-vessels, with an arrest of secretion in the muciparous glands. This is soon followed by the second stage, which consists in the pouring out of a moderate amount of serum from the blood-vessels, together with increased secretion of mucus from the glandular structures. The inflammatory process usually is most active in those parts of the larynx wherein the mucous membrane is loosely attached to the parts beneath, such as in the ary-epiglottic folds, the arytenoid commissure, and the ventricular bands. The mucous membrane of the cords consists practically, as we know, of epithelial cells and a minute network of blood-vessels. At this portion of the larynx we have, therefore, merely dilated blood-vessels, without increased secretion. The laryngeal mucous membrane below the glottis is rarely involved to any notable degree. When this part, however, is involved, it becomes the seat of considerable swelling and injec-

[1] Vol. i., p. 105.

tion. The mucous membrane of the epiglottis rarely presents any marked evidence of inflammatory action.

SYMPTOMATOLOGY.—The prominent and most notable symptom in connection with an attack of this affection lies in the impairment of the voice, which may be hoarse or completely lost, dependent upon the extent of the inflammatory action. If the mucous membrane covering the cords is notably injected, their vibrations are naturally so far interfered with as to give rise to a hoarse, croaking voice. Complete loss of voice in an attack, however, I think, is almost invariably the result of extensive swelling of the arytenoid commissure, or possibly of the subglottic membrane, thereby interfering with the approximation of the cords. It is exceedingly rare to meet with a case of acute laryngitis, even of an aggravated form, in which a vocal tone cannot be produced, provided sufficient effort be made. A patient is usually disposed to use the whispering voice, even when phonation is possible. This is undoubtedly due, in part, to the fact that phonation requires a labored effort. In probably the majority of instances, however, a certain nervous or hysterical element enters into it, with perhaps some little disposition to exaggerate the gravity of the condition. The hoarseness of the voice is largely due to the thickening of the vibrating ligaments, producing a note of lower pitch, although the weakness of the tensors and interference with the approximation of the cords adds to the symptom. The voice is also notably weakened. This is due to the fact that certain of the phonatory muscles immediately underlie the inflamed mucous membrane, and are thereby hampered in their action.

Cough is occasionally present. This symptom, as we know, is a reflex effort to expel a foreign body from the air passages, and, in this affection, would be due to the swelling of the membrane or to the presence of mucus in the larynx. The amount of secretion is very limited, and the extent of the swelling not in itself sufficient to produce any notable symptoms other than interference with function. Hence, the cough is rarely troublesome, and when present, I think, is due, as a rule, to a complicating tracheitis. If the subglottic portion of the larynx, however, is involved, the cough is liable to be troublesome and persistent. It is, however, exceedingly rare to meet with an acute subglottic laryngitis in an adult.

Pain is not ordinarily present, although there is usually a feeling of soreness about the region, with slight tenderness on external pressure, or digital manipulation. Cough, moreover, when present, is of a harsh, irritating, metallic character, which aggravates the pain and soreness of the parts, and is rarely attended with any ex-

pectoration. If such be present, it is a thin, glairy, semi-opaque mucus, rather than muco-pus.

Painful or difficult deglutition is only present when the disease accompanies an acute pharyngitis or some acute affection of the parts above.

Practically, the discussion of the symptoms of an ordinary attack of this affection in an adult has to do only with the impairment or loss of voice; and such other symptoms as may be present are of a somewhat trivial and unimportant character. The disease is purely a local one, and ordinarily is attended with no marked systemic disturbance, although, if it accompanies or complicates an acute affection of the naso-pharynx or nasal chambers, it may be attended with loss of appetite, headache, and other evidences of mild febrile disturbance.

DIAGNOSIS.—The recognition of the disease is easily made by the character of the voice, although the laryngoscope should always be made use of, to determine the amount and extent of the inflammatory process. This is easily effected, in that the morbid condition rarely renders the fauces so sensitive as to interfere with the examination, although, of course, if the upper air tract be involved, the parts are somewhat less tolerant than in a state of health.

An examination of the parts simply reveals the whole mucous membrane lining the larynx of a bright red color, the tint of the membrane being deeper in those parts which are loosely attached, such as the ary-epiglottic folds, ventricular bands, and the arytenoid commissure. The appearance of the vocal cords, I think, in this affection is often indicative of the extent of the inflammatory action, and hence these should always be inspected with especial care, their appearance frequently indicating the severity of the attack. In a mild case, we may see simply the enlarged blood-vessels in the membrane thrown into strong relief by the white tissue of the cord beneath. If the attack is more severe in character, we find the whole cord presenting a pale pinkish tinge, while in still more aggravated cases we observe a deep red, beefy appearance in the membrane, not only of the cords, but in other portions of the larynx.

If the subglottic portion of the larynx is involved, which, as before stated, is a rare event, this is only recognized when the cords are in a state of abduction, when the membrane below will be seen bulging out in a rounded mass, symmetrical on either side, of a deep red color, and notably encroaching on the lumen of the subglottic region. Where this occurs, the symptoms, as before stated, are to an extent aggravated, and the attack itself is to be regarded

as somewhat graver in character. A subglottic laryngitis, moreover, occurs somewhat independently of the supra-glottic form, and may even assume a severe type, without notable involvement of the upper portion of the larynx.

The movements of the cords, as seen by examination, are normal in character, although their excursion is somewhat hampered by the swelling of the membrane, and while abduction is normal and complete, adduction is imperfectly accomplished, not so much as the result of impaired muscular action, as from the fact that the movements of the arytenoids are interfered with by the swelling of the mucous membrane of the commissure. The chink of the glottis, moreover, in phonation, assumes a somewhat wider elliptical shape, on account of the impairment of tension, as exerted by the thyro-arytenoid muscles. Browne[1] describes a triangular gaping of the cartilaginous glottis, as occurring in this affection, which he attributes to a paretic condition of the arytenoid muscle. I have never seen any gaping at this point which could not be better explained by the mechanical interference with the approximation of the arytenoids by the swollen commissure. The same writer argues a similar paretic condition of the thyro-arytenoids, as recognizable by the laryngeal image. Ziemssen[2] also suggests a deficiency of innervation to account for certain conditions recognizable by the laryngoscope. I am disposed to think these observations are unimportant refinements, in that the movements of the cords, and the shape of the glottis, as seen by the laryngeal mirror, are easily accounted for by the mechanical conditions, which result from the swollen mucous membrane. Furthermore, the appearances which the membrane presents are the same as those presented by any mucous membrane in a state of acute active inflammation, and should be subjected to the same tests as any membrane in a similar condition which can be brought under direct ocular inspection. In this connection, however, we should mention the case of acute laryngitis reported by Kidd[3] which is quite unique, I think, in that apparently, as the result of the local infiltration of the muscles by the inflammatory process, there was complete paralysis of both abduction and adduction, the cords lying in the cadaveric position. When they recovered their motility, the adductors resumed their action first, the abductors last.

The diagonsis need not necessarily depend entirely upon laryngoscopic examination, in that a careful analysis of the symptoms will usually clearly indicate the seat and extent of the inflamma-

[1] "The Throat and Nose and their Diseases," 3d edit., London, 1890, p. 283.

[2] Ziemssen's "Cyclopedia," Amer. edit., vol. iv., p. 203.

[3] Brit. Med. Journ., 1888, vol. i., p. 1061.

tory process. The loss or impairment of voice sufficiently points to the larynx as the seat of the disease, while the absence of cough, with expectoration, eliminates the question of a bronchitis. This, taken in connection with the absence of febrile disturbance, is usually sufficient to render the diagnosis clear. If cough be present, it is of a somewhat trivial character, and the expectoration is slight; moreover, the tone of the cough is similar to the tone of the impaired voice, and has a harsh and oftentimes metallic ring to it, the character of which we usually recognize as croupy. Our diagnosis, moreover, is aided by the fact that the attack usually comes on in connection with an acute inflammation of some portion of the air passages above. Of course we meet with impairment of the voice in syphilis, tuberculosis, neoplasms, and paralysis, but the voice in these affections presents characteristics which are somewhat distinctive. In syphilis, it is harsh, grating, and raucous in character; in tuberculosis it is soft and notably weakened; there is also marked impairment of health, together with more or less profuse discharge. In paralysis the voice is simply weakened, and not hoarse. In neoplasms it is usually a broken, cracked voice, dependent upon the size, character, and location of the growth. Furthermore, the impairment of voice comes on gradually and somewhat insidiously in tumors of the larynx.

COURSE AND PROGNOSIS.—The disease runs its course in from five to ten days, and usually undergoes spontaneous resolution. It involves no dangers to life. Its main importance is in the impairment of function which it entails. To persons in the ordinary walks of life, this is not a serious affair. To those whose special calling involves the highest powers of the larynx, such as singers and public speakers, the affection becomes of importance, only as interfering with their special work.

It is a popular impression that a cold settling in the larynx has a tendency to extend down on to the chest. If such tendency exists, I think it is not in any way to be attributed to the disease of the larynx, but rather to such a morbid condition of the air tract above as may have originally caused the chronic inflammation of the laryngeal membrane, which was the predisposing cause of the acute laryngitis.

TREATMENT.—If the attack comes on in connection with an acute inflammatory process involving some portion of the passages above, I think the primary indications for treatment consist in measures directed to these parts, and not infrequently it will be found that the laryngeal disease will disappear without further interference. Thus, if it complicates an attack of acute rhinitis, the nasal mucous membrane should be thoroughly anæsthetized

and exsanguinated by the application of cocaine, and an application of chromic acid or other suitable agent made to prevent the recurrence of turgescence, after the manner already fully described.[1] If the attack occurs in connection with an acute nasopharyngitis, this region should be subjected to thorough cleansing, and the applications of sedative and astringent lotions, as previously detailed.[2] In addition to this, the system should be brought immediately under the influence of aconitia, which, as previously stated, I am disposed to think, oftentimes acts as a specific in controlling an acute inflammation of the lining membrane of the nasopharynx. If an acute laryngitis occurs during the period of early manhood or youth, especially the latter, I am disposed to think that it is secondary in most instances to some engorgement, acute or chronic, of the lymphatic tissues of the fauces, those in the vault of the pharynx being most active in this direction; while those which compose the lingual tonsil are also not infrequently the source of an attack of acute inflammation of the larynx, far more frequently, I think, than is generally supposed. The prominent indications for treatment here, therefore, consist in the use of cleansing douches to these tissues, followed by the application of one of the following, in the order of preference: compound tincture of iodine, glycerole of tannin, and nitrate of silver, in the strength of ten to twenty grains to the ounce. While the above measures, in all cases, have a marked effect on the morbid process in the larynx, and in many cases are sufficient without further treatment, the local applications to the laryngeal membrane itself undoubtedly aid very much in hastening a resolution of the attack, and in those cases in which the disease occurs apparently without any complicating disturbance of the parts above, of course the prominent indication consists in local applications to the larynx. Curiously enough, we find Mackenzie,[3] Browne,[4] Sajous,[5] Gottstein,[6] Cohen,[7] Schroetter,[8] Semon,[9] and others objecting to topical applications to the larynx in this affection, on the ground not only that they fail to give relief, but that they are even injurious and aggravate the local morbid process. I can only understand their objection to these measures on the ground that the application is made by means of the brush, sponge, or probang, and therefore the

[1] Vol. i., p. 116. [2] Vol. i., p. 513.

[3] "Diseases of the Throat and Nose," Amer. edit., Phila., 1880, vol. i., p. 274.

[4] "The Throat and Nose and their Diseases," 3d edit., London, 1890, p. 285.

[5] "Diseases of the Nose and Throat," Phila., 1886, p. 333.

[6] "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 87.

[7] "Diseases of the Throat and Nasal Passages," Phila., 1879, p. 428.

[8] "Vorlesungen über die Krankheiten des Kehlkopfes," Leipzig und Wien, 1887, p. 64. [9] Brit. Med. Journ., 1880, vol. i., p. 121.

injurious effect is the result of the instruments used, rather than of the local astringent. I think it is a rule which may be safely followed in all cases, that our applications to so delicate an organ as the larynx should be made in such a way as shall do the least possible injury to the soft parts. The larynx is easily reached by means of the ordinary atomizers, such as those shown in the preceding volume;[1] and in applying topical remedies to this organ, therefore, I think an atomizer should always be used. In this way, we not only fail to irritate the parts, but it has been my unvarying experience that the use of astringents is attended with the best of effects in this disease. The agents to be used are, in the order of preference, as follows:

Liquor ferri persulphas, .	gtt. 5 to 10 to ℥ i.
Argenti nitras, ...	grs. 2 to 5 to ℥ i.
Zinci chloridum, ...	grs. 5 to 10 to ℥ i.

A better local effect, perhaps, is obtained by first spraying out the larynx with a mild solution of borax, soda, or any mild unirritating cleansing lotion. These applications may be repeated daily until entire relief is given. I question if steam inhalations are of very much value, in acute laryngeal inflammations, in shortening the duration of the disease, although they undoubtedly give notable relief to subjective symptoms, especially at the onset of the attack, when the membrane is dry and the parts are stiff and painful. Certain of the volatile oils and gum resins, which are rendered volatile by the action of hot water, may be employed with benefit in the earlier stages of the disease, such as the compound tincture of benzoin, camphor, oil of tar, creasote, oil of eucalyptus, oil of turpentine, oil of peppermint, and the oleoresin of cubebs. A drachm of one of these drugs is placed in an open-mouthed bottle or cup, and six or eight ounces of boiling water poured upon it; the bottle is then held under the mouth, and the fumes drawn into the air passages by inspiration. The action of the drug is obtained by this simple apparatus quite as well as by the elaborate forms of inhalers sold in the drug-stores. These drugs do not possess astringent properties, but their action is stimulating, hence they promote secretion, and thereby relieve the congested blood-vessels, and thus not only hasten resolution, but add to the comfort of the patient.

I have never been convinced that counter-irritants in the form of blisters, poultices, or hot fomentations produce any notable effect in an acute laryngitis, and I think they should be avoided in all cases. Cold applications to the neck, frequently changed, if

[1] Vol. i., Figs. 41 and 42.

used with discretion, and persisted in for sufficient time to test their efficacy, will oftentimes serve to notably cut short an attack of acute laryngitis, and, if undertaken early enough may, in certain instances, abort the attack. In using cold fomentations, I think it is as well also to make limited use of ice lozenges, thus securing the action of the cold both internally and externally. An excellent method of applying cold to the surface is by means of Leiter's coil[1] or an ordinary ice-bag. If wet cloths are used, they will fail to be of service unless they are changed every thirty seconds.

The value of throat lozenges in an acute affection of the larynx is very questionable. They consist usually of a small amount of some efficient drug, incorporated in a fruit paste or other vehicle, which, being melted by the saliva, is slowly swallowed. In this way the specific drug is supposed to come in contact with the laryngeal membrane. If a laryngitis occurs in connection with a pharyngeal disorder, a lozenge containing muriate of ammonia, chlorate of potash, cubebs, peppermint, lactucarium, cocaine, or even some of the astringents, such as rhatany, krameria, tannin, and gallic acid, etc., may afford a certain amount of relief by their action on the fauces. This is all that we should look for, however, in the use of such remedies. The counters in our drug-stores are laden with a numberless variety of throat and cough lozenges, which are used indiscriminately, and in a majority of cases probably with injury. Many of them contain opium, which I think should never be given in a simple local inflammatory condition of the larynx; it disorders the digestion, and has no direct effect on the seat of the disease. Most of the lozenges are of a large size, and made up of powdered sugar, fruit paste, various forms of candy, etc., and are therefore somewhat objectionable, in that they are liable to cause impairment of digestion and appetite as well. In recommending these preparations, therefore, I think that we should have some distinct idea as to their action. There are certain remedies which have not only a local, but a constitutional effect in an acute laryngitis; these are notably ammonia, cubebs, and the mint series. Cubebs and mint contain certain principles which are volatile at the temperature of the body; when taken into the mouth, therefore, in the form of a lozenge, or in the ordinary cubeb berry, this principle is volatilized and inhaled, and herein probably lies the beneficial action of these drugs, in that their fumes, coming directly in contact with the inflamed mucous membrane, serve apparently to allay irritation, and reduce the turgescence of the blood-vessels. Muriate of ammonia, on the other hand, is probably taken into the general circulation, from which it

[1] Lenox Browne, "The Throat and Nose and their Diseases," London, 1891, p. 119.

subsequently makes its exit through the mucous membrane of the air passages, and in its passage exerts its special influence upon a catarrhal process, stimulating the membrane somewhat, establishing freer secretion from its surface, and thereby allaying vascular plethora. When taken as a lozenge, we therefore have the local action of the salt on the pharynx, if this be involved in the inflammatory process, and also its further action on the mucous membrane of the larynx. An excellent way for its administration, I think, is in the small compressed tablets sold in the drug-stores. If the pharynx is affected, we may use the combination of chlorate of potash with muriate of ammonia salt; but if the case is one of pure laryngitis, chlorate of potash is of no service. The peppermint may be administered in the form of the small lozenge sold by confectioners, or the oil may be given in doses of three drops, on a small piece of crystallized sugar, and repeated every hour or two as may be necessary. Cubebs is best given in the form of the dry berry, as in this way its volatile principle, viz., the cubebic acid, is obtained in its freshest stage. This drug is disagreeable to some patients, and an excellent substitute is the rounded head or corolla of the clove.

General medication is not specially indicated in acute laryngitis, although early in the disease I think it is always well to administer a saline laxative, and put the patient on small doses of quinine for a few days, or, better still, to administer five or ten grains of salicin three times daily until the attack passes away. If there is much irritation of the larynx, and the cough becomes a symptom of any prominence, we are often compelled to administer some anodyne. Lactucarium often answers a good purpose in these cases; it is a harmless drug, and may be given quite freely. An excellent form for its administration is in the lozenges sold in the drug-stores under the name of Pâte Aubargier. Failing this, we may administer codeine in doses of from one-eighth to one-sixth of a grain, repeated every four hours.

We are often called upon by public singers or speakers, seeking relief from a hoarseness, or a complete loss of voice, when it becomes a matter of some importance that the disability should be relieved at the shortest possible notice. I know of no definite method by which such a result can be unfailingly secured in any given time. The plan to be carried out in these cases, however, may be briefly specified as follows, the measures being stated in the order of their importance: First. Absolute and total rest of the voice, the patient being directed to utter no tone above a whisper, and even the whispering voice to be avoided as much as possible. Second. Confinement to the room, which should be kept

at a fixed temperature of from 68° to 70°, not above; while, at the same time, ample ventilation is secured without involving a draught of air. Third. Charging the atmosphere with an abundance of moisture by means of steam generated from a spirit-lamp, or some other equally unobjectionable method. Fourth. The application of cold to the surface, by means of Leiter's coil or the ice-bag. Wet cloths to the neck are attended with a certain amount of risk, as they involve radiation from the moist surface of the skin. Fifth. The application to the larynx of a solution of nitrate of silver, five grains to the ounce, by means of an atomizer, to be repeated a second or third time during the day; the interval of the application and the strength of the solution being governed somewhat by the subjective symptoms resulting, and by the laryngoscopic appearances. Sixth. If the turbinated bodies are swollen, they should be reduced by an application of chromic acid, after the manner already described. Seventh. If there is an acute inflammation of the membrane lining the vault of the pharynx, this should be thoroughly douched by the post-nasal syringe, and an application made of a solution of nitrate of silver, thirty grains to the ounce, while at the same time the patient should be placed under the influence of aconitine, one-five-hundredth of a grain being given every hour until three doses have been given, and afterward every two hours until the constitutional effects are experienced, as evidenced by the prickling of the fauces, tingling of the lips, or reduction of the pulse. Eighth. If there is any tendency to constipation, the bowels should be kept open by a saline laxative; this is especially indicated if the naso-pharynx is involved. For this purpose, a claret-glassful of Villacabras, a tumbler of Hunyadi-Janos, Friedrichshall, or Condal water may be given.

The above plan of treatment seems perhaps somewhat elaborate, and yet, without question, in many cases it will be successful in restoring a voice in from twenty-four to forty-eight hours which otherwise might remain in a state of impairment for several days; and while, in the ordinary walks of life, this impairment may not be considered serious, and we do not feel justified in confining our patients to the house and subjecting them to this plan of treatment, certainly in those cases where the restoration of a singing-voice becomes a matter of special importance, we are not justified in sparing any effort which may secure the desired result, and therefore are compelled to resort to the somewhat elaborate plan detailed above.

CHAPTER XXIX.

ACUTE LARYNGITIS IN CHILDREN.

In young children the glottis is not only much narrower than in adults, but the mucous membrane is more highly vascular, and more loosely attached to the parts beneath. An acute laryngitis, therefore, at this period of life pursues a somewhat different course, and hence it seems wise to consider it under a separate heading. Moreover, we find it presenting itself in two varieties, dependent on the portion of the larynx which is involved. Thus, in certain cases, that portion only of the mucous membrane which is above the vocal cords is mainly affected, and in these cases the attack runs a somewhat mild course, while, in those instances in which the mucous membrane below the vocal cords is involved, the attack is liable to present symptoms of a much more alarming character, in that not only is the breathing-space much more notably encroached upon, but also that certain systemic symptoms are manifested which add markedly to the gravity of the affection.

The laryngitis of childhood practically belongs to all ages up to twelve or fourteen, although it manifests its peculiar features below the age of eight. The majority of cases, probably, occur between the first and fourth years.

Acute Supra-glottic Laryngitis.

This is a mild form of inflammation of the mucous membrane lining the larynx, which is practically identical with that which occurs in adults, as far as the etiology and symptoms are concerned. Its predisposing causes are mainly in some mild catarrhal condition of the upper air tract, while the exciting cause is usually an exposure to cold. In many instances it occurs in connection with an attack of acute rhinitis, although it may develop without any apparent complicating disturbance of the parts above. The onset of the attack may be marked by a slight febrile movement and loss of appetite, or it may come on without any apparent constitutional disturbance. The voice becomes hoarse, and in rare instances is completely lost. Well-developed cough is not usually

present, although there is a sense of irritation in the larynx which gives rise to a slight hacking attempt at clearing the throat. Tenderness of the parts, as shown by external manipulation, is almost a constant feature of the disease.

The inflammation here confines itself mainly to the mucous membrane covering the ventricular bands, the posterior commissure, and the vocal cords. The movements of the larynx are not markedly interfered with, although closure of the glottis, of course, is impaired by the infiltration of the ventricular bands. The swelling of the mucous membrane is but slight, and dyspnœa is rarely if ever present. Spasm of the glottis rarely if ever occurs in this form of laryngeal inflammation, this symptom belonging more particularly to the subglottic form of the disease.

Supra-glottic laryngitis, therefore, is really of a rather trivial character, its main importance being in connection with the question of diagnosis, in that any disease affecting the upper air tract in young children always becomes a source of apprehension. The diagnosis is mainly based on the absence of febrile disturbance, the coincident attack of acute rhinitis, and the character of the voice, which is hoarse rather than aphonic. The tenderness over the larynx, moreover, is a symptom of considerable diagnostic value.

If it is possible to secure a laryngoscopic examination, this of course will add much to the certainty of the diagnosis. This examination is much more easily made in young children than is generally supposed, and I think in all cases it should be attempted, at least where the inspection of the larynx would add to our information. If the child is not sufficiently tractable to submit to the examination, a momentary glimpse of the interior of the larynx may oftentimes be accomplished during the act of retching, which takes place always in a refractory child during the manipulation.

The disease runs its course in from one to two weeks, and involves no dangerous tendencies other than the possible supervention of the subglottic form of the disease, although it must be borne in mind always that a catarrhal laryngitis may occur in connection with measles and other of the exanthems. The primary stage of a croupous inflammation of the larynx is an acute catarrhal inflammation. The exudation, however, makes its appearance so rapidly, and occurs in connection with such high febrile disturbance, that any doubt in diagnosis is cleared up in a comparatively few hours, the croupous disease being rapidly progressive, while the simple catarrhal inflammation under consideration develops its most serious symptoms at the onset of the attack.

We have stated that this form of acute laryngitis in children involves no grave tendencies, and yet I think that we must all

recognize the fact that a mucous membrane in a state of acute inflammation affords a favorable nidus for the lodgement and absorption of a disease germ, such as that of croup or diphtheria, whereas if the membrane were in a state of health the same germ would lodge upon it and fail of absorption. I believe this point to be an important one, as explaining what might oftentimes seem obscure. Thus, in those cases in which a croupous laryngitis develops somewhat late in the course of an ordinary catarrhal laryngitis, the natural inference would be that the catarrhal inflammation finally developed into the croupous form, whereas as a matter of fact the two diseases bear no definite relation to each other further than that above suggested.

While, therefore, we regard this form of laryngitis in children as being somewhat trivial in character, yet I think, in view of what has just been stated, that it is a matter of importance that the disease should be subjected to active therapeutic measures in all cases. If it occurs in connection with an acute rhinitis, the measures directed to the nasal cavity become of the first importance. For this purpose the following may be used:

℞ Cocainæ muriat., ... gr. ij. to iv.
Aquæ, ... ♏ xv.
M. fiat solutio et adde
Glyceriti acidi tannici, ... ʒ i.
Ol. petrolati, ... ad ℥ i.

This should be applied by means of the nasal atomizer[1] every two or three hours. In very young children, as we know, the turbinated tissues are not well developed. Hence, the cocaine in the above is used to diminish vascularity, while the tannin has the effect of checking secretion. The above may be used in watery solution, although I think a certain permanency of actionis secured by the fluid vaselin. For the tannin in the above prescription, any of the simple astringents may be used, probably with equally good effect.

For the morbid process in the larynx, our main dependence would be upon the administration of mild demulcents, in connection with some preparation of cubebs, ammonia, or of the mint series, after the manner already described in discussing the treatment of acute laryngitis in adult life.

The bowels should be kept mildly open by some preparation of rhubarb or, better still, possibly, castor oil. External applications to the neck and chest of camphorated oil or amber oil will be found to be particularly efficacious. I doubt if inhalations for this

[1] Vol. i., Fig. 47.

form of disease, of the vapor of steam, are of any permanent service, although it is wise to confine the child for a few days in the nursery kept at an equable temperature, while at the same time the atmosphere is well surcharged with moisture.

Acute Subglottic Laryngitis.

In this form of the affection, while the mucous membrane throughout the whole of the larynx is in a state of mild inflammation, we find that portion which is below the glottis swollen and infiltrated to such an extent as to give rise to dyspnœic symptoms, which are oftentimes of a most alarming character.

This is an affection which is oftentimes described in medical literature as false croup, spasmodic laryngitis, and laryngismus stridulus, and by some of the older writers Millar's asthma, thymic asthma, etc.

Etiology.—The exciting causes of this form of disease differ in no essential degree from those which give rise to an attack of the supra-glottic form. Beyond this, however, there are certain predisposing causes which seem to be particularly active in the developing of an inflammatory process in the subglottic tissues of the larynx; for while to the milder or supra-glottic form the term "croup" does not especially apply, in that there are no prominently croupy symptoms, to this form of the disease the term "croup" seems to be particularly appropriate, in that the hoarse, barking, stridulous cough, with dyspnœa, etc., which are so characteristic of an attack, are admirably described by this term; and when we use "croup" here, it is to be understood that we refer to the term as it is conventionally used, rather than as defining a morbid process which is attended by the development of a false membrane. Thus, it is a frequently observed clinical fact that not only are certain children croupy in this sense, but this tendency seems to run in families, thus indicating some constitutional condition which predisposes to it.

We are usually told that it occurs with equal frequency in strong, healthy children and in weakly children. This is only partially true, for, whereas its victims usually show no marked evidences of malnutrition, yet I think, probably, in a large proportion of instances we will find that they are suffering from what Potain[1] calls lymphatism, meaning by this term a tendency toward the involvement of lymphatic tissues, under the influence of which children develop enlarged tonsils, hypertrophy of the lymphatic tissue in the pharyngeal vault, etc.; and while not constituting fully de-

[1] Dict. Encyclop., art. "Lymphatique."

veloped struma, he describes it as a normal condition which, if carried a step farther, would result in a strumous habit.

The important influence of this lymphatic habit in the development of catarrhal affections of the upper air passages is a matter of frequent clinical observation. Furthermore, as Sappey[1] has shown, the lymphatic distribution of the mucous membrane of the upper air passages in children is far more extensive than in adult life. We find these lymphatics aggregated in the pharyngeal vault and in the fauces, and undergoing certain changes, under the influence of this lymphatic habit, which set up catarrhal processes, these catarrhal processes in this region necessarily giving rise to a tendency to irritation, and perhaps a mild inflammatory condition, in the air tract below.

As we have already insisted upon heretofore, in the large majority of instances a chronic inflammation of the mucous membrane commences first, and recurrent attacks of acute inflammation become a prominent symptom. I am disposed to think that this also occurs in connection with the disease under consideration, and that we have a mild chronic inflammation of the laryngeal mucous membrane, excited by the catarrhal condition of the passages above, and added to, perhaps, by a certain amount of infiltration of the laryngeal mucous membrane. This is especially prominent in that portion of the larynx below the vocal cords, where even a moderate amount of encroachment upon the normal lumen establishes a somewhat serious condition. While, however, I regard the lymphatic habit as the most frequent predisposing cause of subglottic laryngitis, it is altogether probable that it arises in conditions where this habit does not exist. Bad hygienic surroundings, insufficient nourishment, improper clothing, and general causes of this kind undoubtedly predispose to it. Prolonged crying may give rise to sufficient laryngeal irritation to induce the disease.

We have stated that it affects equally both healthy and ill-nourished children. This assertion does not, however, preclude the possibility of the lymphatic habit exercising an important influence in the causation of the disease, in that these children usually present a well-nourished appearance, although an examination of the body will ordinarily reveal some evidence of it in enlarged glands in the cervical region, or possibly enlarged faucial or pharyngeal tonsils. Gerhardt[2] states that enlarged tonsils and other obstructive diseases of the upper air tract are the most frequent causes of the affection. I think we arrive at a better comprehension of the disease by regarding a subglottic laryngitis, and

[1] "Anatomie Déscriptive," Paris, 1869, vol. ii., p. 861.

[2] "Handbuch der Kinderkrankheiten," Tübingen, 1878, vol. iii., second half, p. 101.

the enlarged tonsils when present, as both manifestations of the lymphatic habit.

We have stated that the mild form of laryngitis or the supra-glottic form arises in practically the same way as in an adult, viz., from some diseased condition of the upper air tract. How frequently a simple catarrhal rhinitis or other affection of the upper air tract, aside from lymphatic enlargement, may act in producing a subglottic laryngitis it is not easy to say. Undoubtedly such may occur. On the other hand, we may have cases of the mild or supra-glottic form of laryngitis occurring with lymphatic enlargements, in connection with marked evidences of the lymphatic habit, as shown by the enlarged faucial and pharyngeal tonsils. I am disposed to think, however, that in a large majority of cases a laryngitis which arises in connection with engorged lymphatics in the passages above will take on the subglottic form; while a laryngitis which arises in a child free from any evidences of lymphatic disease will assume the mild or supra-glottic form.

It occurs more frequently in boys than girls. According to Guersant,[1] it occurs between the ages of one and eight; while Rilliet and Barthez[2] state that it occurs between the ages of three and eight; and D'Espine and Picot[3] assert that it is especially frequent between the ages of two and seven. These statistics were based entirely upon cases of laryngismus stridulus, or those instances in which spasm was the prominent symptom, and in which no laryngoscopic examination was made. Dehio[4] has seen cases of subglottic laryngitis up to eleven and twelve years of age.

PATHOLOGY.—The morbid processes which occur in the laryngeal mucous membrane have already been clearly indicated in what has been said before. These consist of the ordinary changes which characterize inflammatory action involving the mucous membrane lining the whole larynx. The notable activity, however, in this process is noticed in that portion of the larynx which is below the glottis, where any swelling of the part necessarily encroaches to a seriouss extent upon the respiratory tract. A certain amount of laryngeal stenosis beneath the glottis is always a prominent feature of this form of laryngitis in children. It is difficult to account for this symptom by a single acute catarrhal inflammation of the mucous membrane, unaccompanied by œdema. But œdema does not occur in this region. Hence, the view already advanced seems an exceedingly plausible one: that a prominent

[1] Revue méd., Oct., 1829.

[2] "Maladies des Enfants," Paris, 1853, vol. i., p. 357.

[3] "Maladies de l'Enfance," Paris, 1884, p. 612.

[4] Jahrbuch der Kinderheilkunde, 1883, vol. xx., p. 243.

element of tumefaction lies in the engorgement of the lymphatics, which in child-life are richly distributed in this region. We account, therefore, for the respiratory stenosis by the swelling and tumefaction of the mucous membrane proper beneath the cords, superimposed upon and crowded forward by the infiltrated lymphatics underlying it.

SYMPTOMATOLOGY.—The attack may come on independently of any involvement of the parts above, but in most instances it occurs coincidently with an attack of nasal stenosis, the result of an acute inflammatory process involving the mucous membrane of the nasal cavity, or the structures in the naso-pharynx. The constitutional disturbance is more marked here than in the milder form of laryngitis; and although the febrile movement is not characterized by an elevation of temperature usually exceeding 100° to 101°, yet the systemic involvement is indicated by the marked general malaise. The appetite is impaired, and the child is dull and listless, and shows a lack of interest in its toys and other amusements.

The first symptom which calls attention to the throat, of course, is the hoarseness. This in the early stage is shown, not by loss of voice, but rather by a certain shrillness or metallic ring to the voice. The child is indisposed to talk, showing that the effort is to an extent painful; and when the voice is used, a greater effort is necessary to bring the cords into proper tension, thus giving rise to a piping, high-pitched tone. As the inflammatory process progresses, the voice becomes distinctly hoarse or completely aphonic

Cough sets in very early in the attack, and immediately assumes that peculiar tone which we all recognize as being croupy in character. An ordinary cough is produced by the sudden opening of the glottis, hitherto closed, with a coincident propulsion of a blast of air through it, and, furthermore, a certain amount of tone is given to the cough by the vocal cords. In a croupy cough, on the other hand, this closure of the glottis is probably produced, not entirely by the vocal cords, but by the apposition of the swollen subglottic laryngeal tissues, and the tone of the cough is given by the blast of air rushing through this pseudo-glottis thus formed. The result is a harsh, dry, barking cough. That the source of the cough is in the subglottic tissues, I think, is clearly indicated by the fact that, even where the child is completely aphonic, the cough will still have this same barking, metallic ring to it. This cough, moreover, is closely analogous to that which we meet with in tracheal obstruction, from the pressure of an aneurism or other form of tumor from without, the only difference being that here the obstruction is lower down in the trachea. The cough, therefore, has a deeper chest resonance to it.

At the beginning of the attack, the secretion from the mucous membrane is arrested. The cough, therefore, is of a dry, harsh character. After the first or second day secretion sets in, in consequence of which the cough is attended with a certain amount of expectoration, and is of a softer character, although still maintaining its croupy ring. As the subglottic obstruction makes its appearance, we have a new symptom developing, in that the cough occurs somewhat in paroxysms, and, moreover, is attended with a peculiar crowing inspiration, the tone of which possesses something of the same croupy character as the expiratory portion of the cough.

From the very onset of the attack nocturnal exacerbations become a prominent and marked feature, and in many cases, whereas the child shows no very grave symptoms during the day, it is liable during the night to have severe attacks of paroxysmal cough and also of dyspnœa. These generally come on after the child has been asleep for a few hours. The cause of these nocturnal exacerbations undoubtedly lies in the fact that the child, sleeping with the mouth open, inhales an atmosphere which irritates and dries up the laryngeal mucous membrane, and thus aggravates the local symptoms and temporarily increases the dyspnœa—the result, probably, both of an increased swelling of the membrane, as well as of an accumulation of inspissated mucus in the narrowed portion of the larynx. These conditions, of course, are easily avoided during waking-hours by the normal movements which take place in the parts in the act of eating, drinking, etc. After a few hours of sleep, the child suddenly starts up, either with a paroxysm of croupy coughing, attended with a crowing, dyspnœic inspiration, or it wakens with a sudden and violent attack of dyspnœa. This symptom is the one which has given the name of larnygismus stridulus, or spasm of the glottis, to this form of laryngitis. Rilliet and Barthez,[1] D'Espine and Picot,[2] J. Lewis Smith,[3] and Gottstein[4] assert that true spasm of the laryngeal muscles is a prominent element in the causation of the dyspnœic symptoms during these exacerbations. I am disposed, however, to fully agree with Rauchfuss[5] and Dehio,[6] in the assertion that these symptoms are sufficiently accounted for by the inflammatory swelling, and that muscular spasm has probably little if anything to do with the condition.

As an almost invariable rule, the attack occurs at night and after the child has slept for a while. It comes on suddenly, and

[1] "Maladies des Enfants," Paris, 1853, vol. i., p. 351.

[2] "Maladies de l'Enfance," Paris, 1884, p. 612.

[3] "Diseases of Children," Philadelphia, 1890, p. 646.

[4] "Die Krankheiten des Kehlkopfes," p. 80.

[5] Gerhardt's "Handbuch der Kinderkrankheiten," Tübingen, 1878, vol. iii., pt. 2, p. 116.

[6] Loc. cit.

persists for half an hour or perhaps longer, but noticeably subsides when the child has been enabled, by voluntary effort or otherwise, to dislodge the accumulated mucus, and to moisten and soften the membrane by cooling drinks, steam inhalations, or other measures. It is a noticeable fact, however, that even after these symptoms have passed away, a certain amount of obstruction is observed in the child's breathing. This may be recognized, in a more or less prominent degree, during the whole course of the attack. An obstructive sound is heard with each act of inspiration—a soft, rushing sound, as of an inspiratory whisper, showing that the stenosis is a permanent one. That there is some deficiency of action in the laryngeal muscles cannot be questioned, in that the thyro-arytenoids and lateral crico-arytenoids underlie the inflamed mucous membrane, and are probably to a certain extent infiltrated. That this impairment ever results in true spasmodic action, I think, is very questionable, especially when we consider that all the symptoms can be more rationally and easily explained without entering into the obscure question of spasm.

While the disease persists, a second or even a third attack may occur during the same night, although but one exacerbation is the rule. While the attack of laryngitis may last for one or even two weeks, these nocturnal exacerbations of dyspnœa rarely occur over three or four times. The first attack is usually the most serious in character, and on the second and third nights, and perhaps the fourth, they recur about the same hour, although with less severity, and finally cease.

Another characteristic of this form of laryngitis is that children who once suffer from an attack of this form of disease are very liable to have similar attacks recur with each exposure. Thus, during the damp seasons of the year, a child may have a number of such attacks. With the setting in, however, of the warm and soft weather of summer, the child shows little evidence of trouble. During the intervals of the winter attacks, as a rule, the voice is apt to be thick and husky, and, moreover, the child shows evidence, usually, of some chronic catarrhal disease of the upper air passages.

DIAGNOSIS.—A laryngoscopic examination, if obtainable, will always afford us the best information as regards the special affection with which we have to deal. As before intimated, this can and should be made, even in small children, much more frequently than is ordinarily attempted. If the larynx can be inspected, we find its whole mucous lining reddened and slightly swollen, while on inspiration there can be seen below the vocal cords, and intruding itself in the line of vision, the rounded masses of subglottic tissue, bellying out beyond the line of the true vocal cords, highly

injected, and of a deeper red than the tissues above, with a tint verging on a purplish hue (see Fig. 58). They stand out in somewhat striking relief, with the vocal cords immediately above them, which are of a light pinkish color, or they may be almost normal. In many cases the portion of the larynx above the vocal cords may present but very slight evidences of inflammatory action.

In those cases where a laryngoscopic examination cannot be made, the question of diagnosis becomes an exceedingly important one, as determined by subjective symptoms, in that, of course, a serious throat affection in the mind of a parent always suggests either croup or diphtheria, and the elimination of these diseases really constitutes the important feature in diagnosis.

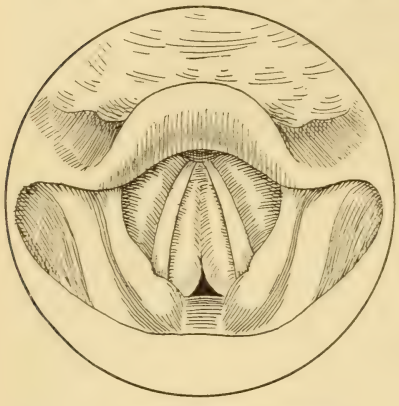

FIG. 58.—Acute Subglottic Laryngitis.

An attack of membranous croup is characterized by very much greater activity of systemic disturbance, together with a higher grade of febrile movement, as shown by the thermometer, than a catarrhal inflammation. Moreover, in croup the cough is not so persistent, and does not assume the same harsh, barking character. In fact, this latter disease comes on somewhat insidiously, the voice becoming completely lost early in the attack, and the dyspnœa, moreover, is progressive, and not characterized by nocturnal exacerbations. The ordinary speaking-voice may be apparently lost in both croup and catarrhal laryngitis. Its character, however, is shown in the cough, which in croup is usually to an extent noiseless, while in the milder disease it is, as before shown, harsh and noisy. In those rare instances in which the croup membrane is located beneath the cords, and in which the voice is not completely destroyed, of course the differential diagnosis is rendered exceedingly difficult, and must be based on objective rather than subjective symptoms.

In diphtheria we have the marked prostration, general malaise, and other evidences of blood-poisoning, which are not ordinarily met with in a simple laryngitis. Moreover, we have, in diphtheria, almost invariably a false membrane in the fauces.

The general course of the disease will always be of marked assistance in establishing a diagnosis. The nocturnal exacerbations, and diurnal amelioration of symptoms, are characteristic of

the simple catarrhal inflammation of the larynx, whereas the slower but usually progressive course of an exudative affection will ordinarily remove any obscurity of diagnosis quite early in the progress of the attack.

Enlarged cervical glands are the rule in all three forms of disease, and hence their presence is of but little diagnostic value.

A foreign body in the larynx of a child will not infrequently give rise to symptoms which cannot be distinguished from a laryngitis. In such a case, the laryngoscope or digital exploration will alone reveal the true condition with which we have to deal at the onset of the attack, although the development of symptoms ought very soon to aid the diagnosis. The possibility of a mistake being made in the opposite way is shown in the case reported by Suchanek,[1] who was called to see a child suffering from a violent dyspnœic attack, which was supposed to be due to a bone in the larynx. A laryngoscopic examination, however, revealed a symmetrical swelling of the tissues beneath the cords, and established the diagnosis of a subglottic laryngitis.

Perichondritis of the cricoid cartilage can only be distinguished from this form of laryngitis in the early stage by a laryngeal examination, which reveals the irregular, nodulated swellings, usually unilateral, encroaching upon the air passages, in contradistinction to the symmetrical appearance seen in the milder disease.

PROGNOSIS.—The disease runs its course in from one to two weeks, and undergoes spontaneous resolution, without involving very serious danger to life. The onset of the attack, as we have seen, is characterized by nocturnal exacerbations of a dyspnœic character, which at the time seem somewhat alarming; yet after the second or third recurrence they cease altogether, each attack being less severe than its predecessor. The cough, however, continues until the end of the attack. This at first is harsh and croupy in character; but after a few days, the secretion from the mucous surface becomes freer, and the cough becomes loose and is attended with a certain amount of expectoration. The voice, also, gradually improves in character, and becomes practically normal at the end of the first week, although still liable to become hoarse, especially toward evening. Rilliet and Barthez,[2] D'Espine and Picot,[3] and Rauchfuss[4] all assert that the disease may cause death —a view which seems clearly substantiated by the fatal cases reported by Jurine, Vieusseux, Guersant, and Trousseau; and yet Meigs and Pepper report a series of 109 cases, with no deaths. Certainly if the disease terminates fatally, it must be regarded as

[1] Correspondenzblatt für Schweiz. Aerzte, 1888, vol. xviii., p. 562.
[2] Op. cit., vol. i., p. 356. [3] Op. cit., p. 616. [4] Op. cit., p. 118.

an exceedingly rare event. I quite agree with Smith[1] in the view that in many instances, probably, where death has resulted, this has been due to some complicating lesion. The only fatal case which this last observer has met with was one in which there was a complicating traumatic gastro-enteritis, the result of the mistaken administration of a dose of kerosene. A fatal issue may be the direct result of the larygneal stenosis, but more probably it arises from an extension of the inflammatory process to the air passages below, causing a capillary bronchitis or a lobular pneumonia. Whether œdema of the lungs may be the direct result of a laryngeal obstruction is still a somewhat unsettled question. In a clear and forcible discussion of this point by Winters,[2] he reaches the conclusion that a pulmonary œdema arises as the direct result of the laryngeal stenosis, it causing rarefaction of air, and dilatation of the capillaries in the air cells; while Van Santvoord,[3] on the other hand, conceding the resultant œdema, argues that this is secondary, and dependent upon weakened heart action.

TREATMENT.—We have here to deal with three conditions: *first*, a mild chronic inflammation of the subglottic mucous membrane —the result, in the majority of cases, of an engorgement of the lymphatics both here and in the parts above, such as the nasopharynx, giving rise to a chronic catarrhal condition; *second*, an acute inflammation of the subglottic membrane, which we regard as a lighting up, as it were, of a chronic inflammation, under the influence of exposure to cold; and, *third*, the nocturnal exacerbation.

Treatment of the Chronic Condition.—The prominent indication for the relief of the chronic condition consists in the administration of some form of iodine, preferably the iodide of iron. This should be given in doses of twenty drops three times a day to a child ten years of age, and to a younger child in proportion. It may be given either alone or in connection with cod-liver oil. It should be persisted in from three to six months, in order to bring fully under control and to correct the constitutional condition which underlies the disease. The general condition of the child, as well as the local enlargement of the lymphatic tissues in the throat and cervical region, should be watched with considerable care; and if at the end of a few weeks a notable diminution in the size of these tumefactions is not evident, either by physical examination or by the subjective symptoms of freer breathing through the nasal passages, the child should be subjected to operative interference. If the faucial tonsils are enlarged, they should be ex-

[1] Op. cit. [2] N. Y. Med. Record, 1885, vol. xxvii., p. 594.
[3] N. Y. Med. Record, 1885, vol. xxviii., p. 9.

cised by means of the tonsillotome. If the lymphatic tissue in the vault of the pharynx is still sufficiently large to cause nasal obstruction, or is still the seat of excessive secretion, the mass should be removed in the manner already described in the discussion of hypertrophy of the pharyngeal tonsil in the previous volume.

It is scarcely necessary to add that, in addition to the administration of internal remedies, the child should be subjected to the best hygienic surroundings, the function of the skin maintained by the judicious use of the bath, the wearing of woollen underwear, etc., while at the same time the general health is promoted by a proper amount of life in the open air, exercise, and the regulation of the diet.

Treatment of the Acute Process.—As soon as evidences of the croupy attack develop, the child should be kept in the nursery, which should be maintained at a temperature of about 70° or 72°. Proper ventilation should be secured, without subjecting the child to a draught, while at the same time the atmosphere of the room should be kept thoroughly charged with moisture, by means of the croup kettle or similar device. The bowels should be acted upon by the administration of, preferably, a mercurial, in the form of calomel or hydrargyrum cum creta, from two to three grains of either being administered to a child from five to ten years of age. The depressants, such as ipecac and tartar emetic, in any of its various forms, so generally recommended in our older literature, are in every way objectionable, and should not be administered.

The object of medication is to promote a freer secretion from the mucous membrane, whereby the engorged blood-vessels may be relieved. For the accomplishment of this purpose we probably possess no more efficient drug than some of the salts of ammonia, preferably the muriate, which may be administered in one of the following:

℞ Ammonii muriatis, ... gr. xvi.
Ext. pruni virg. fld., ... ʒ iss.
Aquæ menth. pip., ... ad ℥ ij.
M. Sig. A teaspoonful every two hours.

Or:

℞ Ammonii carb., ... gr. xij.
Glycerini,
Aq. cinnamomi, ... āā ℥ i.
M. Sig. A teaspoonful every two hours.

If the ammonia is not well tolerated, we may substitute, for either of the salts above given, the tincture of cubebs, in from three to five drop doses.

I do not regard the use of cough mixtures in this disease as a matter of great importance; hence, if the stomach is in any way disturbed, they should be abandoned. In any case the ordinary cough syrup, containing a large amount of sugar, is objectionable. As a rule, the use of opiates should be avoided; and yet if the cough is distressing and persistent in character, it is liable to aggravate the local condition, while at the same time the general strength is impaired by loss of sleep; in such a case the use of a sedative becomes necessary, and we may administer the following:

℞ Acidi hydrocyanici dil., ... ♏ij.
Codeinæ, ... gr. iss.
Ammonii muriatis, ... gr. xvi.
Aq. lauro-cerasi, ... ad ℥ ij.
M. Sig. A teaspoonful every two hours as needed.

The above prescriptions are all for a child of seven years; the efficient ingredients may be given proportionately for younger children.

If the laryngeal affection is accompanied by a catarrhal condition of the nasal passages, local treatment to this region becomes of special importance. If the child is tractable, and old enough to clear the passages, they should be washed out daily with one of the cleansing solutions already given,[1] followed by the application of an astringent;[2] these are to be applied by the ordinary nasal atomizer.[3] If the child is too young to aid the manipulation, we may accomplish much, in the direction of keeping the passages clear, by the use of a weak solution of cocaine, suspended in an oily menstruum.[4]

After the fourth or fifth day, when the nocturnal exacerbations have ceased, and the secretion in the inflamed part has set in, confinement in the nursery is no longer necessary, and if the weather is favorable there is no objection to a short walk in the open air, although the local applications should be kept up for some days, as well as the internal administration of one of the cough mixtures above given, but at intervals of three or four hours, or even longer, according to circumstances. During the course of the attack, the diet should be carefully regulated, and mainly confined to the easily digested and most highly nutritious foods. If the stomach is in any way disturbed, it may be necessary to confine the child to a milk diet; if this is given warm, it undoubtedly exercises a beneficial local effect on the morbid process.

Treatment of the Nocturnal Exacerbation.—The old practice recommends the administration of an emetic in an attack of false

[1] Vol. i., p. 159. [2] Vol. i., p. 160. [3] Vol. i., Fig. 47. [4] Vol. i., p. 115.

croup, the object being to facilitate the expulsion of the accumulated mucus in the larynx. This is a somewhat awkward method of accomplishing this purpose, and it seems to me is an exceedingly objectionable one, in that it is of importance that the digestive apparatus should be maintained in a healthy condition, and the drugs which are administered for the purpose of emesis, such as sulphate of zinc, squills, ipecac, tartar emetic, wine of antimony, turpeth mineral, etc., are liable to produce more than a temporary effect on the mucous membrane of the stomach. Moreover, we are taught that the action of the emetic is to produce relaxation of spasm. We have already taken the ground that there is no spasmodic muscular contraction in this disease; therefore this indication is not present. The production of vomiting undoubtedly relieves the larynx; this can be accomplished with less disturbance to the stomach by simply inserting the finger into the fauces, or, if necessary, as far as the larynx, and should be resorted to if immediate relief becomes urgent.

The first thing, however, on being called to see a child suffering from the dyspnœa of a subglottic laryngitis, is to place the patient in a warm bath, its whole body being thoroughly immersed in water at a temperature of about 100°; we thus not only get the action of the warmth to the skin, but also the benefit of the inhalation of the warm vapor. The stimulating action to the skin may be increased by dissolving a small amount of mustard in the bath; this should be done with great care, of course, when having to do with the tender skin we have in a child. After keeping the child in the bath from five to ten minutes, it should be taken out and wrapped in warm blankets, and put to bed, after which the skin may be dried by the aid of a warm towel passed under the flannel.

These measures failing to relieve, we may give inhalations of hot steam, generated by slacking lime or by a spirit lamp. The efficiency of steam inhalations is aided, perhaps, if we add to the hot water a teaspoonful of fluid extract of lupulin, extract of Pinus canadensis, oil of turpentine, oil of tar, tincture of benzoin, or a few drops of creasote.

Hot fomentations applied to the cervical region, over the larynx, either by means of a sponge or a towel wrung out with hot water, exercise a certain amount of derivative action.

If these measures fail to give relief, an attempt should be made to remove the secretions by means of the finger inserted into the larynx; or, if the operator possesses sufficient skill, there is no objection to gently passing a small sponge probang over the epiglottis and into the laryngeal cavity. This serves not only to dislodge the inspissated mucus, but may produce the movement of retching, by which the obstructing mucus may be expelled.

External blistering or leeching over the larynx probably accomplishes no good purpose.

I know of no drug whose internal administration possesses any special virtue in the dyspnœic paroxysm of a subglottic laryngitis, unless we except the administration of ten or fifteen minims of ether, which may be given when other remedies fail. This may be followed by the inhalation of a small amount of the same. This resort has been especially recommended by Livingstone[1] and Jurine.[2] The action of this drug is probably as a stimulant and expectorant. A somewhat similar effect may be obtained from the use of nitrite of amyl, as suggested by Cohen.[3] In Suchanek's case,[4] already referred to, excellent results were obtained by the use of a solution of cocaine and menthol, applied by means of a spray.

All other measures failing to afford relief to the dyspnœa, the resort should be had either to the insertion of an O'Dwyer tube or the performance of tracheotomy. If the case is an urgent one, and the proper instruments are not at hand for the above operations, a very simple measure, and one which requires no special manipulative skill, is the passage of an ordinary flexible catheter through the larynx and into the trachea. As before shown, however, instances in which radical measures become necessary are exceedingly rare in subglottic laryngitis. Not infrequently, however, when first called to a case of this sort, it is by no means possible to be absolutely sure of one's diagnosis, and we are oftentimes compelled to treat symptoms as they arise, rather than a recognized diseased condition. In most instances, however, I think a careful analysis and study of the symptoms as they present will enable us to determine the special form of laryngeal obstruction with which we have to deal.

In general, we may say of a subglottic laryngitis, that probably the most important part of the treatment consists in the treatment of the chronic condition which predisposes and leads to these repeated attacks of acute inflammation. As a rule, however, we come in contact with these cases during the nocturnal exacerbation; hence, for the time, measures for the relief of this condition become of the first importance. As soon, therefore, as the dyspnœic attack has been relieved, I think the child should be put immediately under the influence of general remedies, which control the chronic condition, while at the same time the simpler measures already indicated should be carried out for the relief of the acute morbid process.

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[1] Amer. Jour. Med. Sciences, 1867, vol. liii., p. 376.

[2] Cited by Rilliet and Barthez: op. cit. p. 361.

[3] "Internat. Encyclop. of Surgery," Phila., 1888, vol. v., p. 290.

[4] Loc. cit.

CHAPTER XXX.

CHRONIC LARYNGITIS.

UNDER this general term we describe three affections of the laryngeal mucous membrane, which, while they constitute distinct diseases from a clinical point of view, are grouped together on the ground that they are all essentially catarrhal processes. They are: *First*, chronic catarrhal laryngitis; *second*, chronic subglottic laryngitis; and *third*, trachoma of the larynx, or chorditis tuberosa.

CHRONIC CATARRHAL LARYNGITIS.

By this term is meant simply a chronic inflammation of the mucous membrane lining the laryngeal cavity, which is purely catarrhal in nature. We thus adhere to the classification of disease which has been adopted throughout the whole course of the present work, and avoid the confusion which has crept into much of our literature on throat diseases.

The olders writers in medicine describe three forms of chronic laryngitis—the syphilitic, tubercular, and catarrhal—an error which is still followed by many who discuss syphilitic and tubercular disease of the larynx under the general heading of "chronic laryngitis," and others who still write of syphilitic and tubercular laryngitis in connection with chronic catarrhal laryngitis. The essentia-morbid processes which constitute syphilis and tuberculosis are not inflammatory in character, as we ordinarily use the term inflammation. Moreover, syphilis or tuberculosis are not to be regarded as the causes of a chronic catarrhal laryngitis. I regard it as a far better nomenclature to adopt the terms "syphilis of the larynx" and "tuberculosis of the larynx," and to restrict the use of the termination *itis* to the designation of an inflammation of a purely catarrhal character; and in using the term "chronic laryngitis," we therefore specify that form of disease of the laryngeal mucous membrane which is characterized by a chronic inflammation of a purely catarrhal nature, and one to which syphilis, tuberculosis, and other constitutional diseases bear no relation whatever, either causative or other.

This form of disease of the larynx is one whose importance has, I think, been greatly overestimated. A very large number of people suffer undoubtedly from this form of laryngeal disease without experiencing any notable discomfort or inconvenience therefrom. It entails no special impairment of the ordinary functions of the larynx in the mere conversational use of the voice, and but a small proportion of mankind require any more extended use of this organ. The finer powers of the human larynx are only called into exercise by public speakers and singers. For those, therefore, who make use of these higher powers, it is essential that the organ should be in a state of absolute and perfect health. While, therefore, a chronic laryngitis is a comparatively unimportant disease with reference to a large portion of mankind, to the singer and public speaker it becomes a disease of no little gravity, in that its existence necessarily either hampers or completely destroys a highly important function of the organ.

ETIOLOGY.—It is doubtful if a simple uncomplicated chronic larygnitis is ever a primary disease. Certainly no case has come under my own observation in which the development of the morbid process could not be traced directly to some diseased condition of the air passages above. It may result from a chronic naso-pharyngitis, hypertrophy of the lymphatic tissue in the vault of the pharynx, or from nasal stenosis as the result of hypertrophic rhinitis, deflection of the septum, the presence of tumors, or other obstructive lesion; it also may arise from an atrophic rhinitis.

As previously intimated, catarrhal processes show a marked hesitancy in transcending anatomical boundaries; a laryngitis probably, therefore, never occurs as the result of the extension of the inflammatory process by continuity of tissue. Its method of development is rather from the interference with the normal respiratory process which a diseased condition of the nasal passages entails.

If the lesion in the nose is obstructive in character, nasal respiration is interfered with, and the important respiratory function of the turbinated bodies is to an extent ablated; the current of inspired air, therefore, reaches the larynx through the mouth; it is not warmed, moistened, and cleansed, as it should be, in its passage through the nose, and hence possesses irritating qualities which, as time progresses, leads to the development of a mild chronic inflammatory process in the laryngeal membrane. It is easy to understand how, in a somewhat similar way, the presence of hypertrophied pharyngeal or faucial tonsils may interfere with normal respiration in such a manner as to lead to a catarrhal disturbance in the larynx. While a chronic naso-pharyngitis does not necessarily give rise to any obstruction to the respiratory current, yet

as a matter of clinical observation it is one of the most frequent causes of a chronic laryngitis. Why this should be so is not entirely clear; it certainly is not due to the secretions from the pharyngeal vault making their way into the larynx, but it is probably the result of the constant hawking, and vigorous efforts at clearing the throat which the lodgement of the thick and inspissated mucus in the fauces entails.

In an atrophic rhinitis, as we know, the turbinated bodies are practically destroyed, and the inspiratory current is neither moistened nor cleansed in its passage through the nose. How this should result in a morbid condition of the larynx, or even of the passages below, is easily appreciated. Between the ages of five and fifteen, the prevailing type of catarrhal disease is dependent upon some involvement of the lymphatic tissues; hence, at this period of life, a chronic laryngitis is in most instances the result of hypertrophy of the pharyngeal tonsil. Between the ages of fifteen and forty we find catarrhal diseases dependent upon some obstructive lesion in the nasal passages; hence, at this period, a chronic laryngeal disorder, in the majority of instances, is the result of an hypertrophic rhinitis or a deflected septum, or both. After the age of forty, the most common form of catarrhal disease is the result of some diseased condition of the naso-pharynx; hence, at this period of life, the source of a laryngeal disorder is to be sought in a chronic naso-pharyngeal catarrh, for it is to be borne in mind that, if an hypertrophic rhinitis, the result of a deflected septum, has previously existed, the membrane in later life undergoes a shrinking, and to a certain extent ceases to be a source of disturbance. While the above division of catarrhal diseases is perhaps not absolutely correct, it certainly applies to the very large majority of cases.

We are usually taught that habits of life, occupation, the improper or excessive use of the voice, etc., may give rise to a chronic laryngeal catarrh; this may be true, and yet I think that, in most instances where the above causes are operative, a more active predisposing cause will be found in some morbid condition of the passages above, as previously described.

While decidedly of the opinion that in the very large majority of instances the cause of the disease is to be sought in the passages above, I am not ready to assert that this is the invariable rule, in that it would scarcely be justifiable to state that local causes may not exert a directly active influence in developing the disease: thus in public speakers, prolonged or excessive or perhaps too vigorous use of the voice may undoubtedly lead to a vascular turgescence which may induce a chronic inflammatory

process. In the same way a singer, by too prolonged or too vigorous practice, or by the use of improper or incorrect methods of tone formation, may set up morbid changes in the membrane, thus straining the voice, as it were. As a rule, the condition which arises from what we call straining the voice is an acute hyperæmia or an acute laryngitis, although undoubtedly, where the exercise has not been of a sufficiently vigorous character to set up an acute hyperæmia or inflammation, a chronic process may ensue, provided the abuse is persisted in.

We are told that those occupations which involve the inhalation of a vitiated or dust-laden atmosphere, such as that of millers, carpenters, coal heavers, stone cutters, workers in tobacco, mill operatives, etc., have a marked influence in producing a laryngeal inflammation; this may possibly be true, and yet it seems to me the statement is somewhat overdrawn. The mucous membrane in the upper air tract is very tolerant, and nature has provided an admirable method for cleansing the respired air in such a way that but little of its impurities reach the larynx. Moreover, I doubt if the mere lodgement of dust or other particles on a mucous surface is sufficient, as a rule, to excite a true inflammatory process. A public speaker who addresses an audience in a small, ill-ventilated, and perhaps overheated room will oftentimes find his voice becoming weak and husky before his address is finished; the same is true of a singer called upon under similar circumstances. The prolonged use of the voice in public speaking or singing is liable to involve a certain amount of mouth breathing. One who is well trained always closes the mouth during inspiration, or recovery as it is called. While, therefore, the vitiated atmosphere may have something to do with the vocal impairment above alluded to, in most instances, probably, the improper methods of recovery are mainly at fault. The influence of impaired digestion, a torpid liver, weakened heart action, and other general causes in the production of a chronic laryngitis are, I think, much overestimated.

The moderate use of alcohol, probably, has but little influence on the larynx, while its excessive use is usually attended by a diffuse general inflammation, through both the naso-pharynx and the oro-pharynx, this condition setting up eventually a chronic laryngeal catarrh. The influence of tobacco is generally dependent upon the individual temperament. Most smokers indulge in the habit with impunity; in certain individuals, however, any slight excess is almost invariably followed by an attack of acute pharyngitis or naso-pharyngitis, and a resultant laryngeal hyperæmia.

An elongated uvula gives rise to faucial irritation, but rarely to

well-developed laryngitis unless the organ is of sufficient length to impinge upon the laryngeal membrane.

Ingals[1] has reported a series of cases of the disease which were dependent upon the rheumatic habit; they occurred in connection with other manifestations of rheumatism, and yielded to general remedies. There was nothing in the laryngoscopic appearances which differed from an ordinary catarrhal laryngitis, although there was a certain amount of localized pain.

Mackenzie[2] states that chronic laryngitis is invariably present in phthisis, cancer, or lupus of the larynx, etc., while Gottstein[3] regards phthisis and scrofula as active predisposing causes. I can only reiterate here that I regard the morbid processes which constitute tuberculosis, syphilis, carcinoma, scrofula, etc., as entirely distinct from a simple catarrhal process, and that we only introduce an element of confusion when we attempt to establish any relation between them. In a patient suffering with pulmonary phthisis, the cough and profuse expectoration undoubtedly tend to excite a local catarrhal process in the larynx; moreover, a patient suffering from any general diathetic condition of a depressing nature is probably more liable to a catarrhal laryngitis than one in perfect health. This, however, is a general law, which does not apply to laryngeal catarrh alone.

All catarrhal diseases of the upper air tract are more common in males than females, and the same law applies to the larynx. It occurs at all ages, although it is most frequently met with in adult life and middle age. As before stated, the disease is not of a serious character, and it is probable that but a small proportion of the cases which occur ever present for relief at the hands of the physician.

PATHOLOGY.—The morbid changes which occur in the mucous lining of the larynx, in an ordinary case of catarrhal inflammation, present no points of special interest. A prominent condition is one of permanent dilatation of the blood-vessels, with an unusual activity of the normal nutritive processes, as shown in an increase of secretion and cell proliferation. If the disease is one of long continuance, further changes of a hyperplastic character take place, under the influence of which the mucosa proper becomes thickened, by the deposit primarily of inflammatory corpuscles, which undergo subsequent connective-tissue transformation. These hyperplastic changes are usually met with in the ventricular bands and the arytenoid commissure. The changes in the vocal cords themselves

[1] Amer. Jour. Med. Sciences, 1888, vol. xcv., p. 22.

[2] "Diseases of the Throat and Nose," Amer. ed., Phila., 1880, vol. i., p. 287.

[3] "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 88.

consist mainly in increased vascularity, hyperplastic changes being exceedingly rare in the mucous membrane of the cords. Rheiner[1] describes a distinct form of chronic laryngitis under the name of "pachydermia laryngis," in which the hyperplastic changes are confined mainly to the posterior portion of the vocal cord, at its junction with the vocal process. These changes consist in an augmentation both of the epithelial and connective-tissue elements of the membrane, the epithelium being superimposed upon and distinct from the papillary layer beneath, in contradistinction to malignant disease, in which the epithelium burrows into and forms nests in the mucosa proper.

These morbid changes are usually the result of a simple inflammatory process, although they may also occur in consequence of erosions. As has already been noticed, an erosion is very rarely a consequence of catarrhal inflammation. When, however, it does occur, it is met with in that portion of the larynx which is the seat of pachydermia, namely, at the posteroir insertion of the cord, or on the anterior face of the arytenoid cartilages. In certain rare instances, dilated and tortuous veins are observed coursing in the superficial layers of the mucous membrane covering the ventricular bands, the ary-epiglottic folds, or the face of the epiglottis. Mackenzie[2] gives to this condition the name of "phlebectasis laryngea," regarding it as an independent affection resulting from strain or other cause. I am disposed, however, to agree with Duchek[3] in regarding it as an adventitious feature of catarrhal inflammation.

Mackenzie, Gordon Holmes,[5] and others describe a form of the disease under the name of "chronic glandular laryngitis," in which the inflammatory process confines itself mainly to the racemose glands, and which they regard as analogous to and in many cases a downward extension of a follicular pharyngitis or "clergymen's sore throat."

I do not recall ever having seen a case of inflammation of the mucous membrane of the upper air passages in which the morbid process confined itself to, or was specially active in, the muciparous glands, but I am disposed to think that, where the membrane presents the gross appearances of this, it is the lymphatic bodies that are the seat of morbid action, rather than the secreting glands. Hence, where we have evidences in the larynx of lymphatic en-

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[1] Cited by Virchow: Berl. klin. Woch., 1887, p. 585. [2] Op. cit., p. 293.

[3] Virchow's "Handbuch der speciellen Pathologie und Therapie;" Abtheil. "Krankheiten des Larynx und der Trachea," p. 492.

[4] Op. cit., p. 292. [5] Lancet, London, 1884, November 8th, 15th, and 22d.

largement, I think this should be regarded as the local manifestation of a systemic condition.

SYMPTOMATOLOGY.—The prominent feature, of course, of the disease consists in an impairment of function in phonation. This is not especially noticeable in the ordinary conversational voice, except where from slight overuse or exertion the voice becomes husky and perhaps hoarse in character. The amount of secretion is not very great, and hence cough is not usually present, although, of course, there is a frequent disposition to clear the throat of the mucus as it accumulates on the vocal cords or at the commissure.

As has already been intimated, the disease is dependent upon a chronic affection of the nose or naso-pharynx. Now, a diseased condition in these cavities is especially liable to set up, not only a chronic laryngitis, but also a tracheitis, and in rare instances a bronchitis of the larger tubes. Hence, if cough with expectoration be present, it should as a rule be regarded as an indication that the morbid process has extended beyond the larynx.

A notable indication of the weakness of function is shown by the fact that, in the morning, after the mucus which has accumulated in the air passages during the night has been removed, the voice is comparatively clear. As the result of the ordinary use which the daily duties involve, the voice is liable to get weak and husky later in the day. In singers and public speakers, and in those whose occupation calls for the higher powers of the larynx, this impairment of vocal function is very noticeable. In public speakers the voice is not only weak, but loses both in quality and volume. Furthermore, it is not only liable to become notably impaired, but even completely lost, after a moderate effort in addressing an audience. Furthermore, the excessive effort required for phonation produces an additional hyperæmia, not only probably of the larynx, but also of the parts below, with the result of inducing a sense of pain and irritation of the parts, with a somewhat persistent and annoying cough. Singing involves even higher and more delicate laryngeal action than public speaking. In singers, therefore, the impairment of voice in a chronic laryngitis is very marked. The voice is not only weak, but its range is notably diminished. The whole register is to a certain extent involved, but the higher tones are particularly impaired, and many of them completely lost. Both in singing and public speaking, a moderate use of the voice results in a tired, sore feeling in the larynx, which very soon compels the individual to abandon further effort. The feeling of weariness and distress which results is of course due to the fact that the laryngeal muscles are brought into play under exceedingly unfavorable circumstances. They are not only ham-

pered by the inflammatory process in the mucous membrane covering them, but the muscular effort required in effecting a proper tension of the cords is very markedly increased. Furthermore, the increased effort in managing the voice not only results in laryngeal fatigue, but also in general weakness, as the result of which the stops are more frequent, the breath is taken more rapidly and often through the mouth, and hence additional vocal weakness results from the abnormal drying up of the mucous membrane.

DIAGNOSIS.—Ordinarily, the disease should be easily recognized by subjective symptoms. The impairment of voice establishes a diseased condition of the laryngeal membrane, while the absence of cough is a fairly clear indication that the parts below are not involved. A definite diagnosis, however, of course, can only be established by the laryngoscopic examination, as revealing the absence of tumors, paralysis, and ulcerative or exudative affections.

When seen by the laryngeal mirror, the mucous membrane lining the larynx will present the ordinary appearances of a chronic inflammatory process. Our best information is obtained from the mucous membrane covering the ventricular bands, and the arytenoid commissure, which presents a deep red, injected, and slightly swollen appearance. This in rare instances extends somewhat to the ary-epiglottic folds, and possibly, to a certain extent, to the posterior face of the epiglottis. Occasionally, a certain amount of thick, inspissated, grayish mucus may be seen covering the mucous membrane, although as a rule our main information is derived from the color of the membrane, excessive secretion not being apparent in the majority of instances.

I cannot agree with Browne[1] and Mackenzie[2] in the statement that the discoloration in chronic laryngitis may be unilateral. A simple, uncomplicated laryngitis, I believe, in all cases shows an evenly diffused and fairly symmetrical discoloration in both sides of the larynx. If this hyperæmia is confined to one side of the larynx, I should regard it as an exceedingly suspicious circumstance, and one which requires the most careful investigation with reference to the possible existence of a more serious affection, such as ulceration, a benign growth, or, more especially, malignant disease, unless a foreign body be present, or some other obvious cause.

The mucous membrane covering the cords, as we know, is composed of epithelial cells, superimposed directly upon the fibrous tissue of the vocal band, with the interposition of a somewhat scanty network of blood-vessels. Hence, in this region, the chronic inflammation is shown by a somewhat grayish discoloration of the

[1] "The Nose and Throat and their Diseases," 3d ed., London, 1890, p. 291.
[2] Op. cit., p. 288.

parts, which stand out in contrast to the red, purplish color of the ventricular bands and other portions of the larynx, which are the seat of morbid changes. Moreover, the cords are slightly swollen, and present certain irregularities, not only on the surface, but on the edges, the result of a somewhat irregular epithelial proliferation. This is apt to be most marked in their posterior portion, and especially in the neighborhood of the vocal processes of the arytenoid cartilages; whereas the vascular hyperæmia gives ordinarily a grayish look to the cord.

In its posterior part are occasionally seen minute blood-vessels standing out in relief above the white fibrous tissue of the cord itself. When these small blood-vessels arrange themselves in the form of a small circle, it is liable to present the appearance of a minute erosion or ulceration, thus encouraging a somewhat prevalent impression that an erosion may occur in a chronic laryngitis. I have never in a single instance seen any condition in the larynx in this disease which warranted the assertion that there was sufficient denudation of the mucous membrane to constitute a genuine erosion.

Additional information is obtained by the movements of the glottis in phonation. Adduction of the cords is not accomplished with that perfection and precision which are observable in health. This is especially noticeable where the arytenoid commissure is swollen, and where there is marked epithelial hyperplasia at its anterior face, constituting an almost wart-like appearance in this neighborhood. In these cases there is mechanical interference with the approximation of the arytenoids, as well as with the inward rotation of the vocal processes. Furthermore, the contraction of the thyro-arytenoid muscles is hampered to such an extent that tension is incomplete; and the glottis in phonation, instead of presenting a linear slit, presents a somewhat elliptical opening, giving rise to a condition which in former times was called an elliptical paralysis.

The epithelial hypertrophy on the anterior face of the arytenoid commissure forms minute, wart-like eminences, which project toward the anterior wall of the larynx in such a way that, when the glottis is closed, the membrane in this region looks as if it were traversed by small fissures. I think this is the condition which has led Stoerk to believe that fissures really occur in the membrane at this point, and to which he gives the name of "fissuræ mucosæ."

PROGNOSIS.—It is an old teaching, in regard to morbid processes in the body, that there is a recognizable effort on the part of nature at reparation, termed the "vis medicatrix naturæ." Whether this

is true of chronic catarrhal diseases of the upper air tract is open to question, for certainly it is very difficult to recognize any such effort on the part of nature in a chronic laryngitis.

The disease runs no definite course, and its symptoms persist as long as the morbid affections of the passages above, which are responsible for it, endure. While, therefore, it shows no tendencies to improve, there is, on the other hand, no marked disposition to grow worse. After the symptoms of vocal impairment have once developed, they persist usually in much the same degree, unless aggravated by special circumstances, such as improper use of or straining the voice. The principal changes which occur in the course of the disease consist in the repeated exacerbations of the inflammatory process, under the form of an acute laryngitis, due to exposure to cold or other causes.

The main point of interest, in the discussion of prognosis, has to do with the possibility of a simple catarrhal process in this region, developing into a more serious trouble, such as a benign or malignant tumor or tuberculosis. It is perhaps not an easy matter to determine just how far a chronic catarrh of the larynx may influence the development of a benign tumor, for, whereas a chronic laryngitis is one of the most frequent of affections, tumors of the larynx are comparatively rare. On the other hand, it is a somewhat unusual event to meet with a laryngeal growth in a patient who does not at the same time show evidences of chronic catarrhal disease of the passages above. We are led to the conclusion, therefore, that a catarrhal inflammation must be regarded as a most active factor in the causation of a laryngeal neoplasm; for while the active hyperæmia which the laryngoscope reveals in the larynx, in a case of neoplasm, may be the result of the growth, the clinical history of the patient usually teaches us that a chronic laryngitis in connection with a diseased condition of the air passages above, existed long before the development of the tumor.

As regards malignant disease in the larynx, I do not think that either our knowledge of pathological processes or the teachings of clinical investigation lend any support whatever to the view that a simple catarrhal process in the larynx is either an active or a predisposing cause of a cancerous growth.

In the early days of laryngoscopy we find Tobold[1] responsible for the teaching that a catarrhal laryngitis may be the cause of a tubercular process in this organ, as well as in the lungs. This view was necessarily based on a limited amount of clinical observation at that time. As our experience of the two diseases in-

[1] "Laryngoscopie und Kehlkopf-Krankheiten," Berlin, 1874, pp 179 and 184.

creased, however, we find Ziemssen,[1] Gottstein,[2] and others taking decided issue with Tobold on this point, and asserting that a catarrhal inflammation stands in no causative relation whatever to the tubercular process. It seems a little surprising, therefore, that so late a writer as Browne[3] should regard the fear of a simple catarrh running into the tubercular form as "a great cause of anxiety." Browne stands quite alone in this view, for, as before stated, I regard the two diseases as entirely separate and distinct, and I know of no clinical observation which justifies us in regarding tubercular disease as even a remote danger in a simple catarrhal process. The case reported by Hunter Mackenzie,[4] of a laryngeal and pulmonary tuberculosis following upon a catarrhal inflammation of seven years' standing, I cannot regard as in any way conclusive. A chronic laryngitis is an exceedingly common disease, and, when we find a tubercular affection supervening upon it, it is exceedingly rare that we cannot trace it to a far more powerful, direct, and predisposing cause than in a simple catarrhal inflammation of the laryngeal mucous membrane. When, therefore, we consider how totally different the two processes are, I think we are fully justified in the conclusion that the milder process is not even a predisposing cause of the graver disease.

The only further element in prognosis which requires consideration is that of the curability of the catarrhal disease. Many writers assert that, even after the disappearance of the morbid condition under proper treatment, the voice is liable to remain weak and hoarse. This I should regard as sufficient evidence that the disease had not been cured; and by a cure I mean, not only of the local morbid process, but of the more important conditions in the air passages above which have been active in its causation. In the present state of local and general therapeutics, I believe we are fully competent to remove diseased conditions, not only of the larynx, but of the parts above; and when such has been accomplished, the voice should be restored to its fullest functions.

TREATMENT.—It has already been asserted, with a certain degree of emphasis, that a chronic laryngitis is not a primary, but a secondary disease, dependent upon some diseased condition of the parts above. The first and most prominent indication, therefore, for its treatment consists in the thorough restoration of the passages above to a condition of health. If an hypertrophic rhinitis exists, it should be treated after the manner already described in

[1] "Cyclop. of the Practice of Medicine," Amer. ed., N. Y., 1876, vol. iv., p. 222.
[2] Op. cit., p. 95.
[3] "The Nose and Throat and their Diseases," 3d ed., London, 1890, p. 292.
[4] Lancet, Lond., Feb. 14th, 1885.

the chapter devoted to that subject. The same is to be said in regard to a deflected septum, chronic naso-pharyngeal catarrh, hypertrophied pharyngeal, faucial, and lingual tonsils, etc. If an atrophic rhinitis exists, this we know to be an incurable disease, and yet, as we have already shown in the chapter on that subject, it is one which can be brought practically under control so far as to obviate to a very great extent the influence of the disease upon the parts below; and hence even where a laryngitis is dependent upon this condition, we may hope by active measures, both at the hands of the physician and the patient, to bring the resultant laryngeal disease under control.

With the removal of the active cause of the disease, in many instances the laryngeal disorder subsides spontaneously, without further treatment, and yet without question the progress of the cure may be markedly facilitated and hastened by certain topical remedies applied directly to the diseased membrane in the larynx.

The question of the value of local applications to the larynx, together with that of the various methods by which they are made, has always been a subject of considerable discussion. As before stated, the prominent indication in the treatment of the laryngeal disease lies in the treatment of the parts above; and yet very much is undoubtedly gained by the direct local treatment. This requires no very special skill of manipulation, and can be easily and effectively made in the hands of one not specially trained in laryngscopic methods. A brush, sponge, probang, or instrument of this sort, I think, should never be applied directly to the laryngeal cavity in a simple catarrhal inflammation, except at the hands of a thoroughly well-trained manipulator, and even then I think as a rule they are objectionable, in that they impinge upon delicate tissues, which are liable to be injured. Furthermore, they fail to reach the parts in anything like the thorough manner in which an atomized fluid does. My preference, therefore, is very decidedly in favor of some form of spray producer, either that worked by compressed air or of some simple hand-ball instrument.

The tongue being well protruded, and the beak of the instrument being passed backward well over the crest of the epiglottis, the patient is directed to sound a high note, which thoroughly opens the larynx, while at the same time the glottis is closed; the spray is then driven directly into the laryngeal cavity. If it is desired to make an application below the glottis, the patient may be directed to inhale at the instant the spray is driven, when the fluid is carried through the glottis and upon the parts below.

I believe, that in the treatment of a simple catarrhal process, the milder astringents are far more efficient than the stronger ones.

The indications for caustics or destructive agents in this disease do not exist. The morbid process is confined mainly to the superficial tissues, and hypertrophic conditions which require destructive measures are exceedingly rare. Of all local astringents, I regard nitrate of silver as probably the best; this should not, I think, be used in too strong a solution. I cannot but think Cohen [1] is somewhat rash in advising a solution of from 60 to 120 grs. to the oz. and in some cases a saturated solution of this drug; although in a later contribution [2] he limits himself to a solution of 60 grs. to the oz.

As a rule, I think a 10-gr. solution is of sufficient strength to accomplish all that is necessary, although in some instances a 20-gr. solution may be used. Still, regarding this drug as most valuable in the majority of instances, a change is occasionally desirable, when we may substitute for silver other drugs of similar action. Thus, in the order of preference, we may use—

Argenti nitras, . . .	gr. 5 to 20 to the oz.
Zinci sulphas, ...	" 5 " 20 " "
" chloridum, . . .	" 2 " 6 " "
Liquor ferri persulphatis, .	min. 10 to 30 to the oz.
Cupri sulphas, . . .	gr. 3 to 10 to the oz.

We thus give decided preference to the use of the mineral astringents. I have never seen any special good accomplished in this disease by the vegetable astringents, such as tannic and gallic acid, and drugs of this order. The same, I think, can be said of iodine and its preparations, carbolic acid, creasote, etc.

Cold inhalations, by means of the globe inhalers,[3] of astringent remedies, such as those above given, although much reduced in strength, are often attended with a certain amount of comfort and relief to the patient; and yet I think the value of this method is largely in those cases in which the catarrhal inflammation has extended somewhat into the bronchi, giving rise to cough and expectoration. The inhalation of nascent muriate of ammonia by the Lewin apparatus [4] is of use mainly in those cases which are dependent on a naso-pharyngeal catarrh, the action of the ammonia being to stimulate the membrane, producing a freer secretion and thereby facilitating expectoration, with a consequent relief to the laryngeal disorder. The direct effect of ammonia on the laryngeal membrane is probably very slight. Inhalations of astringents by means of the steam atomizer are, I think, objectionable, in that

[1] " Diseases of the Throat and Nasal Passages," Phila., 1879, p. 487.
[2] Trans. Amer. Laryngological Ass'n, 1889, p. 116.
[3] See vol. i., Fig. 51.
[4] See vol. i., Fig. 50.

the hot steam is liable to cause a certain amount of relaxation of the parts, while at the same time the astringent is so far diluted as to exert very little direct action on the laryngeal membrane.

We have already discussed the question of throat lozenges in a previous chapter; what was there said is equally applicable to a chronic laryngitis: their use is extremely limited, and at best they afford but a certain amount of temporary relief by their influence on the tract above, for, of course, it is impossible to suppose that any portion of the remedial agent of the lozenge reaches the laryngeal membrane.

It would seem, then, that our topical measures for the treatment of this disease are practically confined to certain astringent solutions applied directly to the larynx by means of the atomizer. Our therapeutic measures thus become exceedingly simple in character. This, I think, is as it should be, for I believe the topical treatment of this disease is really quite a simple matter which has been rendered complicated and obscure by the refinement of discussion of minute and unimportant points, while the main consideration has too frequently been overlooked, of attacking the source of the disease in the parts above.

These direct applications to the larynx should be made somewhat according to circumstances. As we have already seen in the discussion of the catarrhal diseases which cause it, the local treatment is repeated once or twice a week; this is quite sufficient also for the treatment of the laryngeal disorder. I do not believe it is necessary to see our patients every day for a local application to the larynx, as long as the more important branch of the treatment is faithfully carried out as above. It therefore becomes unnecessary to go into minute directions in regard to the immediate effect of the local astringent on the laryngeal membrane, as well as the increase or decrease of the strength of the solution used, the frequency of application, etc. While condemning the use of caustics in the larynx, on the ground that destructive action is not desirable in the majority of cases, yet we occasionally meet with instances of pachydermia in which we have a notable degree of hypertrophy at the posterior insertion of the cords and the anterior face of the commissure, giving rise to what appears almost like warty excrescences in this region. In these cases I think there can be no question of the necessity of using much stronger applications than those recommended in the simple catarrhal process. For this condition, a caustic application becomes necessary: the special agent used is perhaps of not so much importance as the nicety and dexterity with which it is applied, for it is desirable that the application should confine itself closely to the diseased tissue. My own pref-

erence is in favor of chromic acid, fused on the end of a probe, and applied with a properly hooded porte-caustique; although probably the solid stick of nitrate of silver, or acetic acid, might answer an equally good purpose.

There is one element of treatment which becomes of exceeding great importance in treating a chronic laryngitis in a singer or public speaker, and that is as perfect rest to the voice as is compatible with occupation and surroundings. It needs, of course, no demonstration to show that the constant functional activity of the larynx will seriously interfere with the success of topical measures. This of course refers to the function in phonation, in that the respiratory functions of the larynx have no influence on a catarrhal process. An important element in the successful treatment of all cases of catarrhal disease is in the enforcement of certain hygienic rules in regard to the proper clothing of the body, the use of the bath, etc. These have already been fully discussed in the chapter on taking cold.[1]

The habitual use of alcohol probably acts primarily on the digestive apparatus, and secondarily on the upper air tract. When a laryngitis is dependent on a chronic naso-pharyngeal catarrh, whether the latter is the result of the use of alcohol or not, any attempt to cure the laryngeal disorder without absolutely interdicting the use of stimulants becomes entirely useless. The moderate use of wines or alcoholic beverage is probably not directly injurious to the vocal organ; hence, I think it is not always demanded of us, or even wise, to forbid their use in all cases. The influence of the use of tobacco on chronic laryngeal catarrh is to be estimated in each individual case. Excessive use of tobacco is undoubtedly injurious; its moderate use probably has but little effect on the air tract.

When we say that the vocal organs are favorably influenced by the use of preparations of hypophosphites, iron, coca wine, and other nervines, we recognize the fact that any impairment of the general system reacts to a certain extent on an existing laryngeal disorder. I seriously question whether these drugs possess any specific influence on the larynx other than in the manner indicated above. In the same way, when we find the use of certain mineral waters exercising a beneficial influence upon a laryngeal catarrh, we demonstrate quite clearly what has been already urged, viz., that the use of these measures is of special service in certain catarrhal diseases of the upper air tract, especially of the naso-pharynx, thus affording relief to the resulting catarrhal condition in the larynx.

[1] Vol. i., p. 57.

I fully indorse the view that a few weeks spent at a mineral spa, with the attendant rest and recreation, may be followed by the best of results. The point I would make, however, is that the action of mineral waters is not directly, but indirectly beneficial to the laryngeal membrane.

Chronic Subglottic Laryngitis.

This fortunately somewhat rare form of chronic laryngitis is one in which the morbid process develops mainly in the subglottic portion of the larynx, resulting in certain hypertrophic changes whereby the breathing space is so far encroached upon as to result in the development, not infrequently, of symptoms of a grave character. The condition was first somewhat generally alluded to by Rokitansky,[1] who was soon followed by the detailed report of a case by Czermak.[2] Subsequent observations were made by: Gibb,[3] who reported a single case; Tuerck,[4] who reported two cases under the name of chronic œdema; Scheff,[5] who reported a single case, designating it as hypertrophy of the cords; Schroetter, who reported a number of cases, and also gave an admirable general *résumé* of the subject; Gerhardt,[7] who reported a single case, under the name of chorditis vocalis inferior hypertrophica; Burow,[8] who reported four cases, regarding it as hypertrophic in character; Catti,[9] who observed three cases; Ganghofner,[10] who regarded it as similar to Stoerk's blennorrhœa; Henschen,[11] Segond,[12] Gottstein,[13] and von Bergmann,[14] each of whom reported a single case; and Sokolowski,[15] who reported four cases. Mackenzie[16] also gives an excellent description of the disease, referring to twenty-three cases which had come under his own personal observation; while Fischer[17]

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[1] "Manual of Pathological Anatomy," Sydenham Society Publications, 1852, vol. iv., p. 18.

[2] "Der Kehlkopfspiegel und seine Verwerthung für Phys. und Med.," 2d ed., Leipsic, 1863, p. 87.

[3] "Diseases of the Throat and Windpipe," London, 1864, p. 119.

[4] "Klinik der Krankheiten des Kehlkopfes und der Luftröhre," Wien, 1866, p. 204.

[5] Wien. med. Presse, 1871, p. 1313.

[6] Laryngol. Mittheilungen, Jahresbericht, etc., Wien, 1871. "Beiträge zur Behandlung der Larynxstenosen," Wien, 1873. Monatschrift für Ohrenheilkunde, 1878, No. 12, p. 165.

[7] Deutsch. Arch. für klin. Med., 1872–73, vol. xi., p. 583.

[8] Arch. für klin. Chir., 1875, vol. xviii., p. 228.

[9] Allg. Wien. med. Zeit., 1878, pp. 250, 258, 299, and 326.

[10] Prag. med. Woch., Oct., 1878.

[11] Upsala Läkareförenings Förhandlinger, 1886, vol. xxii., p. 373.

[12] La France Médicale, Jan. 19th, 1888.

[13] Op. cit., p. 123.

[14] St. Petersburg. med. Woch., 1885, p. 272.

[15] Gazeta Lakarska, 1889, No. 29.

[16] "Diseases of the Throat and Nose," Amer. ed., Phil., 1880, vol. i., p. 290.

[17] Berlin. klin. Woch., 1884, vol. xxi., p. 799.

has given an excellent *résumé* of the subject, without reporting cases in detail.

ETIOLOGY.—The origin of the disease seems to rest in considerable obscurity ; it occurs more frequently in females than males, and is met with in the earlier periods of life, usually between the ages of fifteen and twenty-five, although one of Catti's cases occurred at forty-nine.

In a number of the cases reported, the patients are stated to have presented notable evidence of the scrofulous habit. We have already taken the ground that the mild chronic inflammation which underlies a subglottic laryngitis in childhood is due to lymphatism, a diathesis, as we know, which is closely allied to the so-called strumous habit. The inference here, of course, is that the lymphatic habit may be a very important active predisposing and perhaps direct cause of this form of laryngitis as met with in adult life. In the only cases of the affection which have come under my own observation, the lymphatic habit, as evidenced by enlarged faucial or lingual tonsils, seemed to exercise a notable influence upon the development of the disease, as shown by the fact that the local condition of the larynx was markedly ameliorated by the removal of the hypertrophied lymphatic tissue in the parts above, and by the administration of full doses of the iodide of iron to correct the systemic condition. Schroetter[1] somewhat vaguely enumerates, among the causes of the disease, tuberculosis, typhoid fever, rhinoscleroma, and perichondritis. That typhus and typhoid fever may result in this form of laryngeal disorder is probably true, although they are more liable to give rise to a perichondritis; tuberculosis and perichondritis constitute morbid processes in which there is no relation either direct or indirect to lymphatic diseases; the same can be said of syphilis. As regards rhinoscleroma, Schroetter[2] seems to think that the hypertrophic changes which occur in the subglottic region, in a catarrhal inflammation of the larynx, bear an analogy to the changes which occur in rhinoscleroma, and therefore that this latter disease may exert a causative influence in the development of subglottic laryngitis—a view which seems to be supported by the cases of rhinoscleroma reported by Schulthess[3] and Ganghofner.[4] That a simple idiopathic inflammatory process in this region, which is not influenced by any pronounced systemic condition, may give rise to a chronic subglottic laryngitis, cannot be questioned, and yet I think in the large majority of instances

[1] Loc. cit.

[2] "Vorlesungen über die Krank. des Kehlkopfes," Wien, 1887, p. 103.

[3] Arch. für klin. Med., 1887, vol. xli., parts 1 and 2.

[4] Zeit. für Heilk., 1880, vol. i., p. 350.

we must look for some diathetic state, to explain the fact of a simple catarrhal process resulting in such marked hypertrophy as to seriously encroach on the breathing space.

PATHOLOGY.—Few post-mortem examinations having been made in cases of this affection, hence suggestions in regard to the true pathological changes which occur can only be speculative; and we content ourselves, therefore, with the views expressed above in discussing the etiology of the disease.

Bandler,[1] however, reports a case in which he had observed the progression of the lesion for five years. The disease began in the nose, and gradually invaded the air passages below as far as the bifurcation of the trachea. The patient died of pneumonia, and an autopsy revealed the lesion in the air passages to be that of rhinoscleroma.

This report certainly goes far to support the view that, in some of the reported instances at least, the disease was really rhinoscleroma.

SYMPTOMATOLOGY.—The onset of the disease is somewhat insidious, and is marked by a slowly developing, but progressive impairment of voice, which finally results in more or less complete aphonia. Cough, with expectoration, is ordinarily not present. As the swelling progresses, dyspnœa sets in, as evidenced both by inspiratory and expiratory stridor; the dyspnœa is not infrequently aggravated by exertion. At this stage of the disease, phonation is practically abolished, and the symptoms consist now in a slow but surely progressive increase of the difficulty in breathing. As is characteristic of all chronic inflammations, repeated exacerbations of mild acute inflammation become a prominent symptom, under the influence of which the dyspnœa is temporarily increased, this increased dyspnœa being due, probably entirely, to a swelling of the parts rather than to any spasmodic element, in that the contractility of the thyro-arytenoid and other muscles in this region is necessarily impaired by the morbid process. With the acute exacerbations, there is liable to be an increased amount of secretion, in consequence of which cough becomes a somewhat prominent symptom; this is a harsh, metallic, ringing, or barking cough, which is apt to be persistent, and oftentimes distressing to the patient. The acute process subsides in a few days or a week, but the chronic process is progressive, until finally the encroachment on the air passages demands relief by tracheotomy, unless other and simpler measures have availed. Pain is occasionally present, especially during the exacerbations, although this symptom is more characteristic of perichondritis than of a subglottic laryngitis.

[1] Prag. med. Woch., 1890, No. 30.

DIAGNOSIS.—An inspection of the parts by the laryngoscope will show in the supra-glottic portion of the larynx the ordinary appearances of chronic laryngeal catarrh, or possibly no deviation from the normal standard, unless in the true cords, which ordinarily present a thick and somewhat rounded appearance, with a grayish, discolored aspect. Immediately below the edge of the cords there will be seen, bulging into the breathing space, from either side, two rounded and symmetrically swollen masses of a grayish appearance, or in rare instances presenting the dark reddish color of a chronic inflammation (see Fig. 59). These tumefactions present an appearance of density and solidity, which give the condition the aspect of a neoplasm. The whole appearance of the mass is suggestive of an interstitial or connective-tissue hypertrophy rather than of a tumefaction due to hyperæmia or chronic inflammation. The extent of hypertrophy necessarily affords a mechanical obstacle to the movements of the vocal cords in phonation and respiration. If the tumefaction is very marked, the anterior portions are in contact, presenting the appearance of an abnormal adhesion, or this coalescence may present posteriorly, or both.

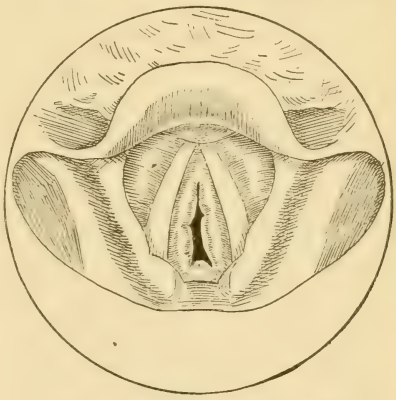

FIG. 59.—Chronic Subglottic Laryngitis.

The essential morbid process which constitutes the disease seems to have to no small extent destroyed the secreting apparatus; hence, the tissues are apt to present a dry and somewhat glazed aspect. If the parts are seen during an exacerbation, the appearances are those ordinarily seen in acute inflammation, unless a certain amount of œdema supervenes, in which case we have the bluish-white, semi-transparent appearance characteristic of that process.

The clinical history of the disease is closely allied to that of perichondritis; in this latter disease, however, the tumefaction is not only irregular in outline, but asymmetrical, and invariably unilateral, whereas the disease in question is always bilateral and presents evenly rounded and entirely symmetrical tumefactions.

PROGNOSIS.—In a few instances, where the disease followed typhus fever, the symptoms developed very rapidly, and required tracheotomy at the end of from one to two months. In the majority of instances, however, as we have seen, the direct cause of the disease is not apparent. In such cases we have a slower and more

insidious development, and the severe dyspnœic symptoms do not appear until from nine to eighteen months after the first manifestations of the affection.

I know of no case in which spontaneous resolution has occurred. In a very large majority of instances, tracheotomy has been necessary. As a rule, where this measure has been resorted to, the tube was worn permanently. In one of Tuerck's cases, the tumefaction seemed to diminish for a time after the insertion of the tube, yet this never was sufficient in extent to permit of its removal. It would seem, therefore, that in the majority of cases the disease is incurable, while in a certain proportion of cases active remedial measures have served to permanently eradicate it.

TREATMENT.—As will be easily gathered from what has been said, we have practically to deal with an organic stricture of the larynx, in which the point of narrowing is in the subglottic tissues.

In the majority of instances, either as the result of the failure of local measures to arrest the disease, or in consequence of its unimpeded development, tracheotomy becomes imperative. This measure was resorted to in Tuerck's, Gerhardt's, Czermak's, Gottstein's, and nine of Mackenzie's cases.

No topical applications seem to be of any avail in promoting resolution of the thickened tissue.

Gerhardt scarified the tissues after the tracheal tube had been inserted, with apparently some favorable result, and yet not sufficient to permit of the permanent removal of the tube. Bergmann did a thyrotomy, and successfully destroyed the thickened tissue by the Paquelin cautery; while Sokolowski met with an equal success by excising the hypertrophic masses, after opening the larynx.

Voltolini[1] advises the use of the electrical cautery, applied through the natural passages; while Mackenzie[2] advises scarification. These measures not only require considerable manipulative dexterity, but are liable to be disappointing in their results; and I quite agree with Schroetter[3] in the view that the subsequent cicatrization may really increase the stenosis.

The first case of this disease which is reported in literature, viz., that of Czermak, was treated by dilating bougies passed directly through the point of stenosis, and, although the treatment was unsuccessful in this case, later reports seem to indicate that the best results are to be expected from this plan, aside from such operative procedures as those resorted to by von Bergmann[4] and Sokolowski.[5]

In place, however, of using the solid bougie, a hollow dilator is used, as in this manner breathing is less interfered with, and the

[1] Monatschrift für Ohrenheilkunde, 1878, No. 9.
[2] Op. cit., p. 297.
[3] Op. cit., p. 105.
[4] Loc. cit.
[5] Loc. cit.

instrument may remain *in situ* for a longer time. Catti[1] seems to have been strikingly successful in overcoming this condition by the use of dilating catheters. He first secured a certain amount of tolerance in the larynx, by the use of probes, and subsequently inserted an ordinary urethral catheter of as large a calibre as the stricture would admit, and gradually increased the size of the instrument. In his first case the subcordal tissue sloughed away, while in his other cases, absorption seems to have been secured, and a permanent cure effected at the end of from eight to fifteen months' treatment.

No case of this disease has come within my own observation in which dyspnœa became a distressing symptom. In those cases, however, which have been under my observation, evidences of the lymphatic habit were sufficiently prominent as to warrant the administration of iodine, which was given apparently with excellent results. The suggestion would therefore seem to be justifiable that the efficacy of some preparation of iodine should be thoroughly tried in these cases, especially if seen during early life or before grave dyspnœic symptoms have supervened. Clinical observation teaches us that a condition of lymphatism yields most readily to the administration of the iodide of iron. The drug should be exhibited, therefore, in this form, especially when we consider the danger of œdema of the upper air tract supervening upon the administration of the iodide of potash and the other binary compounds of iodine.

Trachoma of the Larynx, or Chorditis Tuberosa.

This is an affection of the laryngeal mucous membrane, which was first described by Tuerck[2] under the name of chorditis tuberosa, and which consists in the development on one or both of the vocal cords of a small, rounded nodule or tuberosity. It is occasionally classified under the head of neoplasms. From a clinical point of view, however, it seems more appropriate to consider it as one of the forms of laryngitis, in that the origin of the disease is invariably to be sought in a chronic inflammation of the laryngeal mucous membrane. It consists in the development on the vocal cord, generally midway between the vocal process and its anterior insertion, of a small, rounded projection, which is sessile in character, and stands out from the free border of the cord, showing itself distinctly in profile on the laryngoscopic examination (see Fig. 60). It is of a whitish-gray color, with a moderate amount of noticeable injection of the blood-vessels surrounding it. It develops

[1] Loc. cit. [2] "Klinik der Krankheiten des Kehlkopfes," Vienna, 1866.

somewhat slowly, and rarely attains a size larger than a pinhead. When developed, it remains stationary and shows no disposition to increase in size. There is usually seen on the opposite cord, at the point where the tuberosity impinges upon its fellow in phonation, a corresponding depression, and if the disease persists for a sufficient length of time, a similar nodule develops on the cord of the opposite side, the tuberosities meeting in the median line during attempted phonation.

Tuerck regarded the disease as due to a hypertrophy of the gland structures, but, as we know, there are no muciparous glands in the vocal cords. The pathological lesion is probably somewhat analogous to that of pachydermia, with the addition of a certain amount of connective-tissue hypertrophy. In addition to the latter, Wedel[1] finds large numbers of nuclei, which would seem to indicate an inflammatory process.

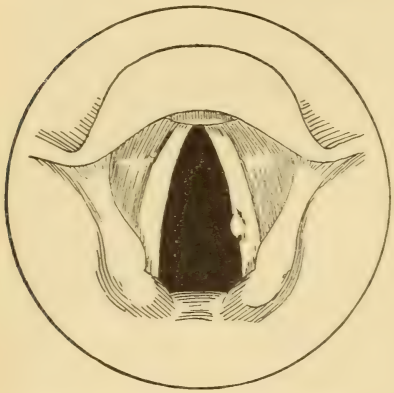

FIG. 60.—Trachoma of Right Vocal Cord.

The symptoms to which it gives rise are confined entirely to the voice. There is no dyspnœa, no reflex spasm, no cough, no pain. There is simply hoarseness or aphonia, resulting from a mechanical interference with the free vibration and proper approximation of the cords.

The affection is easily recognized, and a mistake in diagnosis need not occur. I have frequently seen a small globule of thick, tenacious mucus adhering to the vocal cord in such a manner as to closely resemble trachoma. This disappears, of course, by the use of a cleansing spray.

The treatment consists in the local application of a strong solution of nitrate of silver, of the strength of fifty or sixty grains to the ounce. This should be applied by means of a small pledget of cotton wrapped on a slender laryngeal probe, in preference to either the brush or sponge, as in this manner the application can be nicely localized at the diseased point. A small amount of the silver solution is to be placed only on that portion of the pledget which comes in contact with the cord. Mackenzie[2] advises the use of the perchloride of iron. In one case which came under my notice, the laryngeal forceps were used successfully. As a rule, however, evulsion is not indicated.

[1] Ziemssen's "Cyclop.," Am. ed., New York, 1876, vol. iv., p. 217. [2] Op. cit., p. 294.

CHAPTER XXXI.

LARYNGITIS SICCA.

THIS is a name given to that form of catarrhal inflammation of the larynx which is characterized by a deficiency of secretion and the formation of crusts, which lodge upon and adhere to the laryngeal mucous membrane. This condition was first referred to, somewhat casually, by Rühle,[1] while Lewin[2] soon after reported the detailed history of two cases which were cured by local applications of nitrate of silver. Frankel[3] refers to a single case seen, in which laryngeal crusts occurred in connection with an ozæna. Bresgen[4] reports as a curious and unique case one in which sudden and alarming dyspnœa occurred as the result of crust formation in the larynx. Hendenlang,[5] observing a similar case, investigated the crusts, and detected the presence of mycelial elements. The presence of these, however, he regarded as somewhat adventitious, and in no way indicating that the process bore any relation to mycosis. E. Cohen[6] reports the case of a woman aged fifty-five in which the symptoms persisted for thirty years and accompanied an "atrophic pharyngitis." This was probably symptomatic of atrophic rhinitis or naso-pharyngitis, although the nasal passages were stated to be in a condition of health.

Lublinsky,[7] Luc,[8] and Massei[9] have treated the general subject somewhat at length, the former under the term of "laryngitis sicca," the two latter using the term "laryngo-tracheal ozæna." Further observations have been made by Michel,[10] Schmidt,[11] and Morelli.[12] Browne[13] refers to the disease as one of the forms of

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[1] "Kehlkopf-Krankheiten," Berlin, 1861, p. 76.
[2] "Klinik der Kehlkopf-Krankheiten," Berlin, 1863, p. 371.
[3] Ziemssen's "Cyclop.," Am. ed., vol. iv., p. 140.
[4] Deutsche med. Woch., 1882, p. 593.
[5] Deutsche med. Woch., 1883, p. 121.
[6] Deutsche med. Woch., 1884, p. 1213.
[7] Internat. Centralblatt für Laryngol. und Rhinol., vol. iii., p. 267.
[8] Archives de Laryngologie, Feb., 1888. Journal of Laryngology, 1889, vol. iii., p. 1.
[9] Lezioni Cliniche sulle Malattie della Gola, p. 202.
[10] Internat. Centralblatt für Laryngol. und Rhinol., 1887, vol. iii., p. 267.
[11] Ibid.
[12] Ibid
[13] "The Throat and its Diseases," 2d ed., London, 1887, p. 278.

catarrhal laryngitis, while Gottstein [1] and Schroetter [2] allude to it in but a casual manner.

ETIOLOGY.—I find no case reported in which it did not accompany a diseased condition of some of the parts above. Thus, in a majority of cases it was met with in connection with an atrophic rhinitis; in others an atrophic condition of the naso-pharynx or oro-pharynx was present. This would seem to indicate that the laryngeal affection is symptomatic in character; and yet when we consider the frequency of an atrophic process in the nasal passages, and the infrequency of a laryngitis sicca, we are led to the conclusion that some diseased condition must exist in the laryngeal mucous membrane by which its normal secretion of mucus is diminished or interfered with.

Massei and others suggest that the atrophic process extends from the parts above to the laryngeal mucous membrane. We have already stated, with considerable emphasis, that catarrhal processes do not extend by continuity of tissue from the naso-pharynx into the larynx. I regard this as an almost invariable rule.

The direct cause of the disease in question, therefore, is probably in some morbid condition of the laryngeal mucous membrane, under the influence of which the muciparous glands are either hampered in their function or more or less completely destroyed, resulting in the secretion of a thick, inspissated mucus, which dries up and forms crusts upon the membrane, in something the same manner as occurs in atrophic rhinitis.

The symptoms of the disease are notably aggravated by the inhalation of an abnormally dry atmosphere, as occurs in cases of atrophic rhinitis where the turbinated bodies have been destroyed, and also by the mouth-breathing which becomes a necessary habit in nasal stenosis from any cause.

PATHOLOGY.—That the morbid changes are somewhat similar to those which occur in atrophic rhinitis would seem to be suggested by the investigations of Luc,[3] who has demonstrated the presence in the crusts, of Loewenberg's [4] ozæna diplococcus. This we regard, as previously stated, as an accompaniment rather than the cause of the morbid process.

That the condition is due to local changes, and is not entirely symptomatic of a diseased condition of the parts above, is shown by the fact that the crust formation does not occur in the whole cavity of the larynx, but only in the subglottic portion, as a rule.

SYMPTOMATOLOGY.—During waking hours the normal move-

[1] "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, pp. 82 and 93.

[2] "Vorlesungen über die Krankheiten des Kehlkopfes," Wien, 1887, p. 70.

[3] Loc. cit. [4] Vol. i., p. 164.

ments of the glottis serve to keep the parts comparatively free from crust accumulation. During the night, however, they augment to such an extent that the symptoms on waking in the morning may be of a somewhat distressing character. They give rise to a more or less complete loss of voice, with a feeling of irritation, which compels violent efforts at clearing the throat. If the crust accumulation is large, dyspnœa may be present in a very marked degree, as the result of encroachment on the breathing space. The voluntary efforts at clearing the part in the morning may serve to give notable relief at the time, although the cough, with the impairment of voice and sense of discomfort, generally persists to a more or less extent throughout the day.

The masses, when expelled, present much the same greenish-yellow appearance as those which are discharged in atrophic rhinitis, except that they are smaller in size.

Fetid breath is a constant symptom of the disease, and the source of the fetor can not infrequently be located, in that it is detected in the oral expiration, as distinguished from the fetor of atrophic rhinitis, which is more marked in nasal expiration.

The mucous membrane beneath the crusts is usually somewhat eroded, as shown by the fact that the masses which are expelled are often discolored with blood, and the expectoration may be tinged with blood for some little time following.

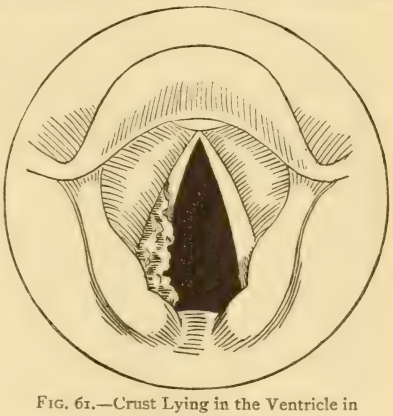

FIG. 61.—Crust Lying in the Ventricle in Laryngitis Sicca.

DIAGNOSIS. — The subjective symptoms are of so prominent a character as to indicate with a fair degree of accuracy the character and location of the diseased process. A certain diagnosis, however, can only be made by the use of the laryngoscope, which will reveal the greenish-gray crusts lodged upon and adhering to the subglottic portion of the mucous membrane and projecting into the lumen of the respiratory tract. In rare instances, thin flocculi of inspissated muco-pus or a dry crust may be seen above the vocal cords (see Fig. 61), and adherent to the ventricular bands or to the arytenoid commissure. In the large majority of instances, however, the disease confines itself mainly to the subglottic portion, and in those cases in which it is seen above the cords the activity of the morbid process is much less.

If the crusts have been expelled by voluntary effort at the

time of examination, there will still be seen the small, yellowish-gray flocculi adherent here and there to the mucous surfaces, while beneath them the subglottic membrane, if visible, will show evidences of an inflammatory process.

COURSE AND PROGNOSIS.—The disease is essentially a chronic one, and shows no tendency to improve except under treatment. Cohen's case, as we have seen, lasted for thirty years. In this instance dyspnœa was not a marked symptom, and yet, in a number of the others reported, distressing dyspnœa set in quite early in the history of the disease, which would indicate that its progress varies in different individuals.

If we are correct in the view already taken, that the essential lesion consists in an atrophy of the glandular structures or the secreting apparatus of the mucous membrane, it would seem that, unless attacked comparatively early in its progress, the disease is somewhat intractable. And yet the atrophic process in the laryngeal mucous membrane is not the only element in the production of symptoms to be considered. If we have the laryngeal disease occurring in connection with an atrophic rhinitis which is incurable, we can only hope to ameliorate the symptoms. If, however, we meet with it in connection with a curable affection of the nasal passages, the prognosis is favorable. That it is ever met with in connection with a perfectly healthy condition of the parts above is probably very doubtful.

TREATMENT.—No matter how far the destruction of the secreting apparatus of the laryngeal mucous membrane may have gone, whatever secretion appears on its surface is still fluid, and can only be converted into a dry crust by subsequent changes. If, now, the nasal passages above are in a state of perfect health, the current of inspired air which passes through the larynx is one practically saturated with moisture and therefore can have no influence in drying up the laryngeal secretions. It is difficult to see, therefore, how a crust formation in this region can occur unless the inspiratory current is rendered abnormally dry by some morbid condition of the passages above.

The first and most important indication for treatment, then, is to establish a healthy condition in the mucous membrane of the upper air tract. If an obstruction exists in the nasal passages, either from a deflected septum, hypertrophic rhinitis, the existence of tumors, or from any other cause, this should be removed. If an atrophic rhinitis exists, our efforts should be directed toward establishing as healthy a condition of the nasal passages as our therapeutic resources are capable of, in the manner already discussed in the chapter devoted to that affection, although the dis-

ease itself is to be regarded as not amenable to radical cure. If a morbid condition of the naso-pharynx is present, this of course should also be subjected to proper medication.

The first indication for local treatment in the larynx consists in such thorough removal of the accumulated crusts and inspissated mucus as can be accomplished without undue irritation of the parts. In Hendenlang's case the detachment of the crusts was only accomplished by the introduction of a probe into the larynx for their mechanical removal. Ordinarily, however, the use of a brush or probang will accomplish all that is necessary. In mild cases the laryngeal atomizer answers an efficient purpose in softening the crusts, and thus enabling the patient to expel them by voluntary effort. The lotions to be used for this purpose may be the same as those already recommended.[1]

After the parts are cleansed, local applications can be made, by means of the sponge or cotton pledget passed directly down upon the part, of one of the following, in the order of preference:

Argenti nitras, . . .	gr. x. to xx. to the oz.
Zinci sulphocarbolas, . .	gr. xv. to the oz.
Zinci chloridum, . .	gr. x. to xv. to the oz.
Acidum tannicum, . .	gr. xx. to the oz.
Acidum lacticum, . . .	ʒ ss. to the oz.
Tr. iodi comp., . . .	ʒ i.–iij. to the oz.

The passing of a brush or probang through the glottis is not an especially difficult manipulation, and is ordinarily accomplished by a quick movement during the act of inspiration. Of course it should always be done with the laryngoscopic mirror in position. The part to be medicated, I think, as a rule, is simply that portion of the larynx which is below the glottis.

As we have seen, the disease has been described as a "laryngo-tracheal ozæna," which would seem to indicate that the trachea also is involved in the same morbid process. These crusts may be seen extending some little distance even below the cricoid ring, and yet it is probable they are simply masses of inspissated mucus, whose source has been in the subglottic larynx and which have made their way down, and attached themselves to the upper portion of the trachea.

During the intervals of treatment it is well to direct the patient to make use, three or four times daily, if the symptoms are distressing, of an inhalation, by means of the steam atomizer or from an ordinary hand-ball atomizer, of one of the cleansing solutions already given. Cohen's case was treated with local applications of

[1] Vol. i., p. 159.

nitrate of silver, but, a relapse occurring at the end of a year, it seems to have been permanently cured by means of a solution of lactic acid, two or three drops to the ounce, used in an inhalator.[1] In the same manner we might use carbolic acid, creasote, oil of tar, acetic acid, etc. Tsakyrogboes[2] reports having found excellent results in the internal use of creasote. The disease is to be regarded as purely a local one, and internal medication is not ordinarily indicated.

[1] See vol. i., p. 43.

[2] Cited by Luc: Jour. of Laryngol., vol. iii., p. 6.

CHAPTER XXXII.

ACUTE PHLEGMONOUS LARYNGITIS, OR ŒDEMATOUS LARYNGITIS.

ŒDEMATOUS laryngitis is a term which has been used to designate that form of laryngeal inflammation which is accompanied by an œdematous process in the mucous membrane, and which is characterized by unusual swelling of the parts as the result of serous infiltration. In the earlier literature we find the term "œdema of the glottis" in frequent use. This we discard, in that the morbid process is really in the mucous membrane of the upper portion of the larynx, while in the large majority of cases the glottis proper either escapes entirely or is much freer from the diseased action than the parts above.

We cannot but be impressed, I think, on looking through the literature of this subject, with the great confusion in classification which is found among the different writers, not only on throat diseases, but on general medicine. Thus, Cohen[1] describes an "acute," "chronic," "infraglottic," and "hemorrhagic" œdema of the larynx; while Mackenzie[2] describes a "typical," "contiguous," and "consecutive" œdematous laryngitis. Ziemssen[3] describes the disease as "laryngitis phlegmonosa." Gottstein[4] and Schroetter[5] divide the affection into an "acute" and "chronic" "submucous laryngitis," and an "acute" and "chronic" "œdema of the larynx." Browne[6] describes an acute and chronic inflammation of the submucous tissue of the larynx.

It seems to me that a very much simpler classification of those affections of the larynx which are attended with œdematous swelling can be made by dividing them into "phlegmonous laryngitis" and "symptomatic œdema," or simply œdema of the larynx, reserving the latter term to designate those cases of œdema which are

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[1] "Diseases of the Throat and Nasal Passages," 2d ed., New York, 1879.

[2] "Diseases of the Throat and Nose," Am. ed., vol. i., p. 277.

[3] Ziemssen's "Cyclop.," Am. ed., vol. vii., p. 791.

[4] "Die Krankheiten des Kehlkopfes," Leipsic and Vienna, 1888, pp. 116, 122, 125, and 130.

[5] "Vorlesungen über die Krankheiten des Kehlkopfes," Vienna, 1887.

[6] "The Throat and Nose and their Diseases," 3d ed., London, 1890.

passive and non-inflammatory; while the term phlegmonous laryngitis, or acute submucous laryngitis as it is sometimes designated, is used to describe a form of acute inflammation of the laryngeal mucous membrane which occurs either idiopathically, or as a complicating lesion of an acute inflammation of neighboring structures and in which the morbid process is characterized by unusual activity, and, moreover, extends to the deeper tissues of the membrane, resulting in an unusual extent of tumefaction in consequence of a serous infiltration of the tissues. This is the form of disease which Gottstein, Schroetter, and Browne describe as "acute submucous laryngitis"; Mackenzie as a "Typical œdematous laryngitis"; Cohen as "Acute œdema"; and many of the older writers as "acute laryngitis."

ETIOLOGY.—The primary and essential lesion in this form of œdema is inflammatory in character. It arises, therefore, from much the same causes as other inflammatory affections in the upper air passages. The most active and practically the only cause which we can find for the affection is an exposure to cold. Why a simple exposure should in one case result in an ordinary inflammatory process, while in the other we have that excessive activity of the morbid process which terminates in an œdematous inflammation, can only be a matter of speculation. In some cases it would seem that the circumstances surrounding the exposure are unusual, or possibly some predisposing cause may lie in an impaired condition of the general health. The local condition is practically an acute cellulitis. This occurs in other regions in the body, oftentimes from apparently slight causes; that it may occur in the same manner in the larynx, clinical experience teaches us.

In many instances, a mild acute laryngeal catarrh seems to act as a predisposing cause of the attack, although it may develop where the air passages are in a state of absolute health.

Charazac[1] regards excessive use or straining the voice as an active cause of the disease. A case reported by Semon,[2] in which the infiltration was confined to the vocal cords, was an instance of this kind.

It is more common among males than females, and is usually met with in early adult life, the majority of cases occurring between twenty and thirty; although, according to Richards,[3] instances have been observed as early as nine weeks and as late as eighty years of age.

That the disease is a comparatively rare one is shown by the

[1] "Étude sur l'Œdème du Larynx," Paris, 1885.

[2] St. Thomas' Hospital Reports, vol. xiii., p. 156.

[3] Amer. Jour. Med. Sciences, Phila., 1890, vol. xcix., p. 451.

investigations of Hoffmann,[1] who in 6,062 autopsies at the Charity Hospital of Berlin found 33 cases of œdema of the larynx, 10 of which were primary and 23 sympathetic in character; while Sestier,[2] in a compilation of 190 cases of laryngeal œdema, found 36 primary and 122 secondary.

We thus see that secondary phlegmonous or submucous laryngitis is a much more frequent disease than the primary affection, and arises from a large number and variety of causes. Among the observed causes of the secondary disease may be noted: quinsy, as observed by Binet,[3] White,[4] Bonker,[5] and others; abscess of the neck, as seen by Josias;[6] glossitis, as observed by Barlow;[7] acute pharyngitis, probably erysipelatous, as reported by Mackern;[8] follicular pharyngitis, reported by Noltering;[9] and iodism, as reported by Fournier,[10] Rosenberg,[11] and others. In Rosenberg's case the tumefaction was subglottic.

Its intimate association with erysipelas, as first noted by Budd[12] as early as 1847, has been a matter of common observation; indeed, Virchow[13] and others regard the disease as really in many instances true erysipelas of the larynx. This view is undoubtedly correct, in that Hajek[14] and Biondi[15] have detected the presence of Fehleisen's coccus in cases of phlegmonous laryngitis which came under their observation.

From a clinical point of view, the point is perhaps not a very important one, in that whether the disease be idiopathic or erysipelatous in character, its development, course, symptoms, and treatment are practically the same.

It may arise in the course of typhoid fever, as reported by Lüning;[16] or it may complicate an attack of variola, as noted by Bandler.[17] It may occur also during diphtheria, croup, typhus, or any of the exanthems. It is also not infrequently traumatic in origin, either as the result of inhalation of acrid vapors or hot steam, and may also in rare instances develop indirectly as the result of swallowing corrosive poisons, or, again, it may occur in

[1] "Œdema Glottidis," Berlin, 1872.
[2] "Traité de l'Angine laryngée œdémateuse," Paris, 1852.
[3] Bull. de la Soc. anat., 1857, vol. xxxii., p. 209.
[4] Buffalo Med. and Surg. Jour., 1845–46, vol. i., p. 30.
[5] New York Med. Jour., 1885, vol. xlii., p. 587.
[6] La France Méd., 1879, vol. xxvi., p. 611.
[7] Lancet, 1864, vol. i., p. 244.
[8] Lancet, 1886, vol. i., p. 87.
[9] Monat. für Ohrenheilk., 1885, p. 205.
[10] Gaz. des Hôpit., 1889, p. 191.
[11] Deut. med. Woch., 1890, No. 37.
[12] "Watson's Practice of Physic," Am. ed., Phila., 1858, p. 548.
[13] Berl. klin. Woch., 1887, p. 401.
[14] Baumgarten's Jahresbericht, 1887.
[15] Deutsche med. Woch., 1886, p. 132.
[16] Arch. für klin. Chir., 1884, vol. xxx., p. 225.
[17] Prag. med. Woch., 1888, vol. xiii., p. 173.

consequence of the impaction of a foreign body in the larynx, or in the passage of such an object into the œsophagus, as in a case reported by Bandler.[1]

PATHOLOGY.—The morbid changes which occur are inflammatory in character, a fact which was recognized as early as 1825 by Bouillaud,[2] and at the onset are identical with those which characterize any ordinary acute inflammatory process involving mucous tissues. Its progress, however, is marked by an unusual activity both of vascular turgescence and especially of serous transudation, under the influence of which the membrane becomes enormously swollen and tense, especially in those situations where it is most loosely attached to the parts beneath, and where, therefore, there is the least mechanical obstacle to the serous distention. These are the ary-epiglottic folds, the ventricular bands, and the posterior surface of the epiglottis. Involvement of the vocal cords is somewhat infrequent, while extension to the subglottic portions of the larynx is a still rarer event.

The swelling diffuses itself somewhat uniformly and symmetrically through both sides of the larynx. As the disease progresses, the transudation changes to a sero-purulent and finally terminates in a purulent infiltration, with abscess formation. Where the process goes on to the formation of an abscess, this is usually unilateral, although in a case reported by Chauffard[3] there was pus formation on each side.

In certain cases the inflammatory process seems to confine itself largely to one side of the larynx, usually in the neighborhood of the ventricular bands or pyriform sinuses, running its course and terminating in suppuration or resolution, without involving the opposite side in anything more than a mild catarrhal inflammation.

SYMPTOMATOLOGY.—The attack is ushered in by chilly sensations, or in rare instances by a well-marked chill followed by a mild febrile disturbance, the temperature ranging from 100° to 100.5° perhaps. This is to be regarded at the onset of the attack probably as the result of the severe exposure to cold rather than as symptomatic of the local inflammatory process. The rapidity of the development of the local process in the larynx is shown by the fact that dyspnœa follows almost immediately upon the onset of the febrile movement. The voice becomes impaired or completely lost, and the breathing stridulous, both with inspiration and expiration. The further development of symptoms are those which characterize increasing dyspnœa. Respiration becomes labored, and the face florid and finally cyanotic. The extreme suffering of

[1] Loc. cit. [2] Arch. générales de Médecine, 1825, vol. vii., p. 174.
[3] Bull. de la Soc. anat., 1881, vol. lvi., p. 430.

the patient is evidenced by his restless movements and anxious expression of countenance. These dyspnœic symptoms may develop in from twelve to twenty-four hours, or at the latest on the second or third day, when death ensues unless relief is afforded by tracheotomy or other remedial interference.

The above description applies to a typical well-developed case of the disease which has resulted from a severe exposure.

In another class of cases which are of a milder type, we have the same rapid development of dyspnœic symptoms, which progress to a certain stage at the end of twenty-four to thirty-six hours, when there seems to be a cessation of further progress, and the disease either undergoes spontaneous resolution, or pus formation takes place. When this latter occurs, the turgescence of the tissues is arrested, and with the pointing of the abscess and the discharge of pus from one side or the other of the larynx, the attack ceases.

A still milder class of cases is found in those instances in which the morbid process confines itself to but one side of the larynx, and results in the formation of a small abscess in this locality. In these cases there is impairment of voice, with a sense of fulness and perhaps of pain in the region of the larynx, but dyspnœa, as a rule, does not occur. These cases run their course in from two to four days, and involve no grave dangers or even special discomfort to the patient. The other subjective symptoms which are met with are principally pain on swallowing, a certain amount of sensitiveness on pressure or movement of the larynx, with cough in young children, although this latter symptom is not usually present in adult life.

DIAGNOSIS.—Our principal concern in meeting with a case of acute laryngeal dyspnœa is to determine whether we have to deal with an exudation, a phlegmon, a passive œdema, or the presence of a foreign body. The clinical history of the case will oftentimes aid us materially in determining this question, although our main dependence must lie in the examination of the parts by the laryngeal mirror, with perhaps the additional knowledge which can be obtained by a digital exploration of the larynx. This latter measure is not ordinarily of much practical value, and yet in an emergency where a laryngoscopic examination is not available, it may serve quickly to determine the presence of a foreign body, or the existence of an œdematous swelling in the parts. The index finger passed back into the fauces should ordinarily reach a tumefaction with facility, if it exists upon the epiglottis or the aryepiglottic folds, and in this manner easily appreciate and recognize the rounded semi-resisting masses which are characteristic of a phlegmonous in-

flammation of the larynx. The main reliance, however, must be placed on the use of the laryngoscope, which will reveal the mucous membrane of the larynx markedly swollen, and presenting all the evidences of an active acute inflammatory process. The membrane presents a bright red color, is tense and somewhat glassy in aspect, and semi-opaque in appearance. In the severer cases the ventricular bands and the posterior face of the epiglottis will present three large rounded masses prominent in the field of vision and practically obscuring the parts below, and presenting a more or less contracted triangular opening between them, through which respiration is carried on. In the milder cases we have the same evidences of active inflammatory action, with a less degree of tumefaction of tissues, while those cases in which the phlegmon is unilateral should easily be recognized by the same general appearances; for although a unilateral tumefaction is always to be regarded as a suspicious circumstance, the clinical history, together with the local appearances, should ordinarily be sufficient to determine the inflammatory character of the lesion.

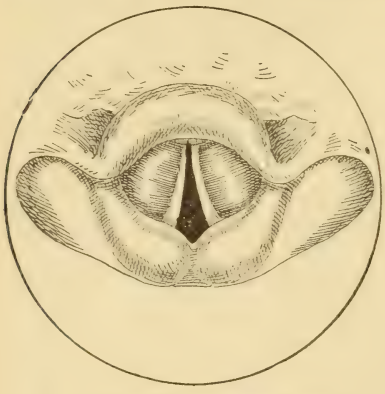

FIG. 62.—Acute Phlegmonous Laryngitis.

PROGNOSIS.—The disease not only develops rapidly, but runs a somewhat brief course, usually terminating practically by the third or fourth day. In those severe cases where the localized swelling so far interferes with respiration as to demand tracheotomy, the dyspnœic symptoms ensue usually in from twelve to thirty-six hours after the onset of the disease. In these cases the encroachment upon the breathing space is due to a serous infiltration. In the milder cases, which run a somewhat longer course, the serous transudation is rapidly followed by purulent infiltration, abscess formation, and the discharge of the pus. The inference we draw from this is, that if a case of phlegmonous laryngitis at the end of thirty-six hours has not developed grave laryngeal stenosis, we may fully anticipate that it will run its regular course and undergo suppuration without the necessity of tracheotomy. In other words, a case must be watched with a considerable degree of care for the first twenty-four hours, in that tracheotomy may become imperative at any moment ; whereas if at the end of thirty-six hours this measure has not become necessary, the probabilities are that surgical interference will not be required.

The essential gravity of the disease lies, of course, in the danger of suffocation. This is practically the only danger; for whereas a number of cases of death from this affection have been reported, the fatal issue was due in each instance to the lack of preparation, and hence, failure to perform, for tracheotomy.

TREATMENT.—Topical applications of astringents or sedatives are practically inert in a laryngeal phlegmon of this character. The first indication for treatment is to secure such local depletion as is possible by free scarification of the inflamed membrane. This can be accomplished by means of Tobold's concealed lancet or any other laryngeal knife that may be available (see Fig. 63). Failing these, resort may be had to an ordinary curved bistoury, the blade being wrapped with thread up to within a quarter of an inch of its point. These scarifications should be made freely, not only along the face of the epiglottis, but on the swollen ventricular bands. This may be done with the aid of the laryngeal mirror, or with the assistance of the index finger in the fauces, provided the dyspnœa is not so great as to render this intolerable to the patient. These scarifications should be repeated twice or three times a day, the effect of the cutting being not only to relieve the turgescent blood-vessels, but to allow the infiltrated serum to escape also.

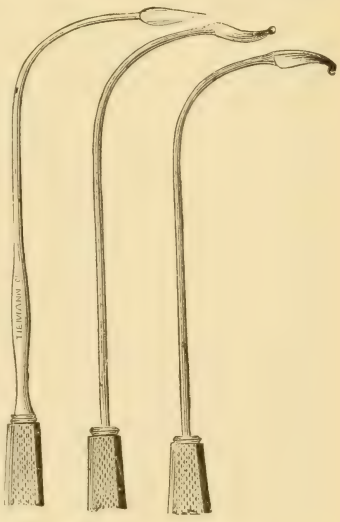

FIG. 63.—Laryngeal Knives.

Steam inhalations may possibly add to the comfort of the patient, but certainly no direct effect upon the morbid process is to be anticipated therefrom. Counter-irritation to the neck by blisters is of no avail, although the application of leeches over the crico-thyroid membrane is to be recommended. Cold applications to the larynx, either in the form of ice-bags or Leiter's coil, if efficiently and persistently maintained, are attended with excellent results. Pellets of ice may also be taken.

Internal medication is not especially indicated other than the administration of an active saline cathartic.

The success of these measures must be watched with great care, and if the progressive development of dyspnœa is not arrested promptly, and this arrest maintained for a sufficient length of time to warrant the belief that the disease is checked, preparations should be made to perform tracheotomy; indeed, it is always wise,

when called to a case of this kind, to have the necessary instruments for this measure ready at hand.

It is exceedingly doubtful if intubation could be performed in a case of laryngeal phlegmon, in that the cavity of the larynx is so far distorted that it is not probable that the tube could be inserted, or, if inserted, would be retained for any length of time. McEwen[1] carried a case of phlegmonous laryngitis successfully through its graver dyspnœic stage by the insertion of an ordinary urethral catheter, a measure which commends itself both by its simplicity and availability.

We have stated above that as a rule the dyspnœa occurs in the early stage of the attack, and is due to serous infiltration rather than to pus formation. This is not true of every instance; thus, in a case reported by Hidalgo,[2] the dyspnœa set in somewhat late in the progress of the disease, and was only relieved by opening an abscess which had formed.

Of course, where the pus formation can be recognized and reached by the knife, the pus should be evacuated. Opening a laryngeal abscess requires somewhat delicate manipulation; hence, unless the physician possesses special skill in this direction, tracheotomy should be preferred. I think there can be little question in regard to the propriety of doing tracheotomy in preference to the higher operation, in that the opening into the air passages should be made as far as possible from the local inflammatory process; although in an extreme case the higher operation will be selected on account of the greater rapidity with which it can be accomplished.

When we consider the large number of cases of this disease which have died from suffocation, and in which the severe dyspnœic symptoms have come on suddenly and in the absence of the attendant physician, it seems scarcely necessary to add that the patient should always have the benefit of any doubt that exists as to the propriety of opening the air passages; a tracheotomy tube inserted, even before severe dyspnœa has set in, may not infrequently save life, and will certainly save the patient from much suffering.

[1] Glasgow Med. and Surg. Journ., 1879, vol. xi., p. 52.

[2] "Memorias leidas en la primera Sección de la Sociedad Española de Laringologia," May, 1886.

CHAPTER XXXIII.

ŒDEMA OF THE LARYNX.

THE term "œdema of the larynx" should, I think, be restricted to that morbid condition of the laryngeal cavity which is characterized by a somewhat extensive serous infiltration of the soft parts, and in which the œdema is the prominent and practically the only local lesion. We undoubtedly have a certain amount of œdema with a phlegmonous laryngitis, as described in the previous chapter, as also with perichondritis and other inflammatory affections. The essential lesion in these disorders, however, is inflammation, and the use of the term "œdema" in connection with them only serves to mislead. We also meet with a certain amount of circumscribed and localized œdema in syphilis, tuberculosis, and occasionally in malignant disease of the larynx. The œdematous infiltration in these cases, also, is entirely a secondary development, and merely an adventitious feature of the more serious morbid process which underlies it. Thus, Peltesohn,[1] in 3,887 autopsies, found œdema of the larynx 210 times. Of these 210 cases, 149 were males, 40 females, and 21 were children. The ages of the males varied from eighteen to sixty, but the disease was seldom found in the later years of life. The ages of the females ranged from twenty-one to fifty-four. Thirteen of the children were under five years of age. Local laryngeal disease existed in 44, such as syphilis, tuberculosis, perichondritis, etc., the œdema in these cases being secondary. In 164 instances the œdema complicated a general diseased condition, such as renal, cardiac, pulmonary diseases, etc. Hoffmann[2] found in 6,062 autopsies that œdema of the larynx was the cause of death 33 times. In 10 of these cases the laryngeal disease was strictly local, while in 23 it existed as a complication of some constitutional affection.

ETIOLOGY.—The cause of the disease is to be found in some local or general condition outside of the larynx, under the influence of which a localized anasarca occurs. Any condition which may cause a dropsical effusion in other portions of the body, may give rise to the same in the larynx. The most common cause is to

[1] Berl. klin. Woch., 1889, p. 959.

[2] Inaug. Diss., Berlin, 1873.

be found in some form of renal disease, as in the cases reported by Hanot,[1] Mackern,[2] Robinson,[3] Peltesohn,[4] Bandler,[5] and others.

Whether any local condition of the larynx exists which predisposes or invites the serous effusion into the laryngeal tissues, can only be a subject for speculation, although it is altogether probable that an œdema is more liable to occur where the laryngeal mucous membrane is in a relaxed condition, than when it is in a perfectly normal state. Serous effusion into the larynx may also occur as the result of an obstruction to the return of the venous circulation, caused by the presence of an aneurismal or other tumor in the cervical or upper thoracic region.

Quinke[6] has described, under the name of "acute circumscribed œdema of the skin," a most curious affection, which is characterized by the sudden appearance, in different parts of the surface of the body, of circumscribed areas of œdema, which, persisting for a few days, subside, subsequently reappearing elsewhere. They are accompanied with a moderate amount of gastro-intestinal disturbance. This writer observes that the larynx may be invaded in the same way, while instances in which this occurred have been reported by Strübung[7] and Osler,[8] under the name of "angio-neurotic œdema of the larynx." The view taken is that the disease is essentially a vaso-motor paresis, the result of a general neurotic condition. The hereditary character of the affection has been thoroughly traced by Osler, who discovered that two deaths had occurred from œdema in the family of the case which he reported, although no death from the disease has been directly observed. Vogt[9] and Tait[10] have reported instances of œdema in the larynx in new-born children as the result of placental degeneration.

PATHOLOGY.—The essential lesion of the disease consists in the escape of liquor sanguinis from the blood-vessels, which diffuses itself in the submucous tissues of the lining membrane of the larynx, giving rise to an extensive swelling and distention of the parts, especially in those containing the largest amount of areolar tissue. As a rule, we meet with three distinct serous sacs, as it were, one on either side formed by the distended ary-epiglottic folds, and one anteriorly formed in the mucous membrane covering the epiglottis.

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[1] Arch. gén., 1885, vol. i., p. 472. [2] Lancet, 1886, vol. i., p. 87.
[3] Bull. of the New York Path. Soc., 1881, 2d series, vol. i., p. 94.
[4] Berl. klin. Woch., 1889, vol. xxvi., pp. 931–959.
[5] Prag. med. Woch., 1888, p. 173.
[6] Monat. für prakt. Dermat., 1882, vol. i., p. 129.
[7] Zeits. für klin. Med., 1885, vol. ix., p. 381.
[8] Am. Jour. of Med. Sciences, 1888, vol. xcv., p. 362.
[9] Norsk Magazin f. Lägevidenskaben, Sept., 1886, p. 638.
[10] London Obstetrical Trans., vol. xvii., p. 307.

The tumefaction of the ary-epiglottic folds extends downward to, and involves the ventricular bands, and also invades the membrane covering the arytenoid cartilages and the commissure, while in front the œdema, starting on the posterior aspect of the epiglottis, mounts to the epiglottic crest, and passes over and is liable to extend as far as the glosso-epiglottic fossæ. In rare instances the œdema confines itself to the ventricular bands without invading the epiglottis; thus, in 17 cases collated by Buck[1] the epiglottis was œdematous in 15.

An extension of this form of œdema to the true cords or to the parts beneath is an exceedingly rare occurrence. Serous exudation constitutes the whole of the pathological process, and no further change takes place either in the exuded serum or in the tissues themselves in consequence of the presence of this exudation; in other words, inflammatory action or pus formation is never a feature of true œdema of the larynx.

Symptomatology.—The onset of the attack is sudden, and usually without previous warning. The first symptoms which the patient experiences are usually those attendant upon obstruction to respiration. The voice is not necessarily lost at the onset of the attack, although as the œdematous swelling invades the ventricular bands and arytenoid commissure, the vibrations of the cords are not only mechanically interfered with, but the movements of the glottis are markedly hampered. The prominent symptom, of course, is the dyspnœa; this has mainly to do with inspiration, in that, whereas the current of air is not notably impeded in escaping from the lungs, with each attempt to inspire, the large tumefied masses which rise above the larynx show a tendency to roll in, as it were, upon each other, thus closing the orifice in a valve-like way, and so hamper inspiration rather than expiration. The attempt to draw air into the lungs, therefore, gives rise to a somewhat noisy, stridulous sound. Pain is not usually present, although there is a sense of fulness and distention in the throat, together with a certain amount of difficulty and perhaps pain in deglutition, the movements of the parts in the attempt to swallow being not only mechanically hampered, but the passage of food or drink over them, and the pressure which the act entails, give rise to painful sensations.

The onset of the attack is not only sudden, but the progress of the swelling is so rapid that extreme dyspnœic symptoms may set in, even a few hours after the first symptom, or at the latest probably in from twenty-four to thirty-six hours. After the stenosis is fully developed, we have the general resulting symptoms, such as

[1] Trans. Amer. Med. Ass'n, vols. i. and iv.

cyanosis, restless movements, anxious expression of face, and other evidences of the suffering which ordinarily accompanies the distress for breath.

Diagnosis.—The subjective symptoms of laryngeal stenosis are usually so well marked that, as a rule, our main consideration is to determine the special form of laryngeal disease which is the cause of the symptom. This can be ascertained either by digital exploration or laryngoscopic examination. If the epiglottis is swollen, the insertion of the index finger will easily recognize the large, rounded, semi-resisting mass beyond the base of the tongue. If the œdema is confined to the ary-epiglottic folds, digital exploration is not so available, in that the passage of the index finger beyond the epiglottis would scarcely be tolerated, especially if any dyspnœa existed. In these cases a laryngoscopic examination should be made, for while the subjective symptoms in many cases would suggest the source of the laryngeal stenosis, an ocular inspection of the parts alone will absolutely determine a differential diagnosis between pure œdema, the presence of a foreign body, perichondritis, or other possible causes of the obstruction.

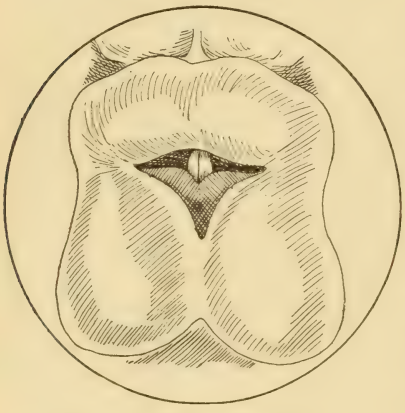

Fig. 64.—Œdema of the Larynx.

The laryngeal mirror in position would bring into view the mucous membrane lining the larynx, presenting the two or three large, rounded, swollen masses (see Fig. 64), according as the epiglottis is involved or not, encroaching upon the lumen of the larynx, and presenting between them the small triangular opening in the centre, through which respiration is carried on. The membrane presents a tense, semi-glassy aspect, of a grayish color and semi-translucent appearance, resembling somewhat the aspect of an ordinary mucous polyp. The œdematous character of the swelling should be easily recognized ; practically there are no laryngeal lesions with which it need be confounded. We may meet with the same amount of tumefaction in acute phlegmonous laryngitis; but in simple œdema, of course, there is the total absence of the intense vascularity which characterizes the inflammatory lesion as shown by the bright red color of the parts. The possibility of an œdema of the larynx being an instance of the angio-neurotic œdema of Strübung should always be borne in mind, although here, as we

have seen, the clinical history of the case will have shown previous manifestations of cutaneous œdema.

PROGNOSIS.—An œdema of the larynx being simply the local manifestation of some grave organic disease, we can easily understand how, when the dropsical tendency manifests itself in the larynx, it should rapidly develop a more or less complete stenosis of this organ. Moreover, if a serous effusion commences in the larynx, we may anticipate a complete stenosis in a comparatively few hours. In the rare instances of a laryngeal œdema, setting in without developing grave symptoms within twenty-four to thirty-six hours, the arrest of the progress of the œdema is to be attributed to some favorable change in the action of the heart, kidneys, or such organs as may have been primarily at fault. Such a change is not to be anticipated, and if it occurs it is one of the rarest of events. In any individual case, therefore, wherein a purely œdematous invasion of the larynx is recognized, we may anticipate that dangerous dyspnœa will ensue in a comparatively few hours, if it has not already occurred, unless our remedial measures are sufficiently prompt and efficient to arrest its further progress.

TREATMENT.—Our first endeavor should be to ascertain, if possible, the cause of the œdema, when prompt measures based on this should be instituted, not so much, perhaps, with the hope of affording immediate relief to the local condition in the larynx, as to prevent a further development of the disease. If the heart is at fault, and its action weak, one minim of either the fluid extract of digitalis or the tincture of strophanthus should be administered hypodermically. If there is kidney disease or cirrhosis of the liver, free action of the bowels should be obtained by the administration of half a grain of elaterium, or, as perhaps securing a prompter action, a drop of croton oil may be given; at the same time free diaphoretic action should be secured by the hypodermic administration of one-eighth of a grain of pilocarpine. This latter dose may be repeated after an interval of from three to four hours, although it must always be borne in mind, in using this remedy, that it is a cardiac depressant and is liable to induce œdema of the lungs; hence, its action should be watched somewhat closely, and, if the indications occur, alcoholic stimulants should be administered to counteract any observed unfavorable action on the heart.

The patient should be kept in a warm room, and in an atmosphere thoroughly surcharged with moisture by means of boiling water over a spirit lamp. Our main reliance for immediate and prompt relief lies in local measures for relieving the laryngeal swelling. These consist in freely puncturing the serous sac and letting out the water. This may be accomplished in the manner already

described in the chapter on phlegmonous laryngitis. These scarifications should be made freely over the whole of the swollen surface, wherever tumefaction is found. The relief which this measure affords is usually prompt and effective, in that the serum pours out freely on the incision of the membrane, and the swelling subsides rapidly. This oozing of the serum, however, may not continue for a sufficient length of time to give complete relief, and hence it may be necessary to repeat it at the end of two or three hours. It becomes necessary, therefore, to watch the case with considerable care until the dangerous dyspnœic symptoms have disappeared.

As regards catheterization, intubation, and the performance of tracheotomy, the same rules apply to laryngeal œdema as have already been given in the discussion of the treatment of phlegmonous laryngitis.

Our discussion of laryngeal œdema has confined itself entirely to the question of a pure œdema of the larynx, excepting those cases in which a moderate amount of œdema sets in as a secondary process to syphilitic and tubercular disease, as well as in perichondritis and other affections of the larynx in which a mild œdematous swelling not infrequently occurs. Œdema in a tubercular or syphilitic larynx very rarely attains proportions which demand local interference. In those instances, however, in which this complication occurs, the rules which govern our management of it are practically the same as those which govern an œdema dependent upon cardiac or kidney disease. The same can be said of an angioneurotic œdema, for while in none of the reported cases has this form of œdema developed such a degree of stenosis as to demand operative interference, yet Osler[1] has reported two instances in which there was a strong probability that the disease terminated fatally.

[1] Loc. cit.

CHAPTER XXXIV.

CROUPOUS LARYNGITIS.

We have already discussed the question as to the duality of croup and diphtheria, taking the ground that the two diseases are separate and distinct, and that we meet with a group of cases which are characterized by fibrinous exudation in the larynx, and in which none of the septic features of diphtheria are present. This affection we designate as croupous laryngitis. As compared with diphtheria, it is an exceedingly rare affection; but that it does occur I am convinced, as the result of the careful study and observation of a number of instances of membranous laryngitis in which the peculiar character of the membrane, the absence of any tendency to necrosis in the exudate, and the sthenic type of the febrile movement convinced me that they should not be included in the same category with a true diphtheria.

The literature of the subject fails to throw much light on the clinical history of the disease or the frequency of its occurrence, in that in former times all acute dyspœnic affections were called croup, while in later years they are usually designated as diphtheria. Thus, as Smith[1] points out, there were reported to the New York Board of Health in 1858 478 deaths from croup and 5 from diphtheria, while in 1875 there were 758 from croup and 2,329 from diphtheria. I think this discrepancy cannot be taken as indicating the comparative prevalence of the two diseases, but rather the influence of current views upon diagnosis. Our discussion, therefore, of this subject will be based largely on personal observation.

Etiology.—Although at the present writing the specific germ which gives rise to a croupous laryngitis has not been isolated and subjected to culture, I am quite as firmly of the belief that the disease is the direct result of the lodgement of a microbe in the fauces or larynx as that diphtheria occurs in this way. As we have already seen, the lymphatic tissues in the fauces afford a convenient lodgement for disease germs, and it is here that in the very large majority of cases the primary deposit occurs, either in the faucial

[1] "Diseases of Children," Phila., 1890, p. 651.

or pharyngeal tonsil. Becoming mechanically entangled in the crypts of these organs, it finds a favorable nidus for propagation. Its presence, moreover, excites a local inflammatory process, which takes the form of a croupous inflammation. Whether the primary lodgement may occur in the larynx, we have no means of determining. I have seen no case, however, in which I could not demonstrate the existence of an exudation in the fauces before any evidence of laryngeal involvement was apparent.

We have already so fully discussed the question of a croupous deposit on the tonsils, both in the form of the so-called follicular disease and also that in which there is a diffused membrane, entering at some length upon the question of its etiology, pathology, and clinical features, that in order to avoid repetition the reader is referred to the former chapter.

It may seem a somewhat rash statement to make that a croupous deposit in the fauces, whether in the form of an acute follicular tonsillitis or a croupous membrane on the tonsil, is to be regarded as presenting a certain amount of danger of the same process developing in the larynx and causing a croupous laryngitis, especially when we consider that acute follicular tonsillitis is a matter of almost every-day observation during the fall and winter months, while it is one of the rarest of occurrences that this affection should be followed by a croupous laryngitis, yet I believe this assertion to be in a measure well grounded. The germ which gives rise to an acute follicular tonsillitis is a somewhat feeble one, and its morbid action is limited to an exudation in the crypts of the tonsils. The same germ in a more active state gives rise to a fibrinous exudation which covers the face of the tonsil. A third germ, which, as I have before stated, I believe to be closely related although not identical with the croup germ, is that which produces diphtheria, a microbe of infinitely greater activity than either of the others.

We must recognize, then, as the teaching of clinical observation, that the croup germ is one of comparatively little vitality. It lodges upon the faucial tonsil, propagates, and gives rise to an acute follicular tonsillitis. In doing this it has apparently exhausted its vitality in the vast majority of cases. In another case it lodges in the fauces and propagates with a greater activity than in the former, causing a diffuse membrane on the tonsils. In a certain proportion of cases, not so great as the former, the diseased process ceases without developing laryngeal complications. A membranous deposit on the tonsils is to be regarded as indicating a much greater danger of a croupous laryngitis than the follicular disease. The point that I would emphasize is that any croupous deposit in the fauces which close observation shows to be purely

croupous and not diphtheritic is attended with a certain danger of a development of a similar process in the larynx. This is a very remote danger in the case of follicular disease—a still remote danger, but much less so, in diffuse membranous exudation on the tonsil, but still a danger that is to be borne in mind.

Susceptibility constitutes another exceedingly important feature of the disease. While a croupous exudation in both forms is very common in adult life, true croupous laryngitis is rarely, if ever, met with. In other words, the mucous membrane of the larynx and trachea affords a nidus favorable for the lodgement and development of this germ. This susceptibility commences at about the end of the first year of life, increases for from six to eight years, and subsequently diminishes until puberty, when the susceptibility practically disappears.

The disease occurs sporadically and endemically, never probably epidemically. It is not to be regarded as contagious in any greater degree than the milder forms of croupous exudation, such as acute follicular tonsillitis.

We have already discussed somewhat fully the relation between an acute catarrhal process and an exudative disease of the air passages, taking the ground that the membrane in a state of acute inflammation affords a far more favorable nidus for the lodgement and development of a disease germ than one in perfect health. An ordinary catarrhal cold, therefore, involving the upper air passages, while standing in no direct relation to a croupous inflammation, must be regarded as a somewhat active predisposing cause of the graver disease, in the manner above suggested.

PATHOLOGY.—The onset of croupous inflammation is marked by the same phenomena which occur in connection with catarrhal inflammation. There is first the dilatation of blood-vessels, which become elongated and tortuous, and this is followed by inflammatory stasis, the arrest of the white corpuscles, their escape into the tissues beyond, together with a certain amount of serum, and the setting up of increased nutritive processes throughout the whole tissue. It differs from catarrhal inflammation, however, in the fact that the escaping serum contains a large amount of fibrin, which, passing through the superficial layer of the mucous membrane, coagulates upon its surface. The increase of the nutritive processes is characterized by the proliferation of large numbers of epithelial cells, which are imprisoned by the fibrin, thus forming a false membrane on the surface, which is composed of large numbers of fibrinous fibrillæ, entangling in their interlacing meshes the proliferated epithelial cells.

It would thus seem that the specific germ, penetrating the tis-

sues, sets up primarily a catarrhal inflammation, and, furthermore, either itself enters the circulation or gives rise to ptomaines which make their way into the blood, causing a condition of hyperinosis, which so far dominates the local morbid process as to give rise to a fibrinous inflammation or exudation.

SYMPTOMATOLOGY.—The disease is ushered in by a chill or notably chilly sensations. This is followed by an active febrile movement, which from the onset assumes the sthenic type. The temperature on the first day may range from 102° to 104°. The skin is hot and flushed, and the pulse rapid and bounding. There is loss of appetite, with pains in the bones, and the urine becomes scanty and high-colored. The child is restless and usually declines food, partially on account of the activity of the fever, and partially as a result of the painful symptoms which almost immediately develop in the throat. The parts feel dry, stiff, and sore, with perhaps a certain amount of external tenderness on pressure. The prominent local symptom, however, is painful deglutition, each attempt being attended with sharp lancinating pains, which shoot toward the neck and ear. The febrile movement continues, and the range of temperature remains practically unchanged for twenty-four to forty-eight hours. The local symptoms in the throat may be prominent or masked, according to the extent of the deposit on the tonsils. During the first day, or possibly not until the second or third, evidences of laryngeal involvement will show themselves in the impairment of voice, which may become hoarse and metallic in character at first, although this is soon followed by more or less complete aphonia, the voice being reduced to a hoarse whisper. Characteristic evidences of membranous deposit in the larynx soon follow, such as inspiratory and expiratory dyspnœa, the former being more pronounced and attended with subclavicular depression, cyanosis, pinched and anxious expression of the face, dilatation of the alæ of the nose, etc. The involvement of the larynx is liable to be marked by a certain accession of febrile movement, with an increase of temperature of from one to two degrees. The further history of the case consists in the rapid increase of dyspnœic symptoms and the final death of the child unless the disease is arrested or the exfoliation of the membrane is secured by the therapeutic efforts at relief. The laryngeal involvement sets in usually as early as the second day, rarely beyond the fourth, and the disease runs its course somewhat rapidly, terminating in death or resolution in from three to six days.

As we have already indicated, there is a somewhat close relation between this disease and diphtheria. This is still further shown, perhaps, in the fact that albumin is present in the urine of a

certain number of cases. This, however, is not a feature of any special diagnostic or prognostic significance, as albuminuria is met with in acute follicular tonsillitis as well as in most of the other acute infectious diseases.

DIAGNOSIS.—The point of special importance as regards the recognition of the disease lies in the differential diagnosis between croupous and diphtheritic inflammation as based on the close observation of the morbid process in the fauces. This has already been fully entered upon in discussing the diagnosis of diphtheria. We simply repeat here that in the graver disease we have a thick, yellow, efflorescent false membrane, closely adherent to the parts beneath, and which cannot be separated from them without the rupture of blood-vessels, and furthermore the exudation at the end of twenty-four hours shows marked evidences of necrosis. The croupous membrane, on the other hand, is a clean, vital membrane, bluish-white in color, thin, but slightly raised above the parts beneath, and constitutes an entirely superficial deposit. The special diagnostic point lies in the fact that it is easily detached from the parts beneath without the rupture of blood-vessels.

Laryngeal examination is not feasible, probably, in most instances, especially in very young children; but even if this were obtainable, as we have already seen, the fibrinous exudation in the larynx in diphtheria is practically a croupous membrane, and therefore one which differs in no great degree from the disease under discussion. Our diagnosis, therefore, will be based on the appearances observed in the fauces on direct inspection.

I seriously question whether a case of laryngo-tracheal diphtheria, so called, ever occurs without a diphtheritic inflammation in the fauces. If such is not met with, I should be disposed to call the disease croupous laryngitis, although undoubtedly many good observers call these cases diphtheria. Any given case, therefore, with a faucial exudation which at the end of twenty-four or thirty-six hours has not assumed a diphtheritic character, as evidenced by the localized tissue-necrosis, must be regarded as a croupous disease, the prominent features of which are the active febrile movement and the superficial pseudo-membranous deposit in the air tract, differing thus from diphtheria, in the absence of evidences of septic infection, as shown by the asthenic type of the febrile movement, and also in the absence of the true diphtheritic process in the fauces, as shown by what the old writers called putrid sore throat.

PROGNOSIS.—The tendency to death in croupous laryngitis is entirely due to the dyspnœic symptoms. The patients die of suffocation, and not from the activity of the blood poison or the prom-

inence of the febrile symptoms. A very large majority of patients die of the disease simply because in the present state of our therapeutic resources we possess no remedy which is capable of combating a pseudo-membranous deposit in the air passages except in a very feeble way. Moreover, when an exudation takes place in the larynx of a child, there is a marked tendency to rapid extension into the trachea and bronchi. In a majority of instances of true croup we are driven sooner or later to our last resource, namely, to open the air passages, a measure which is successful in but a very small proportion of cases where the trachea and bronchi have been invaded, whether the case be croupous or diphtheritic in its origin.

TREATMENT.—In the chapter on diphtheria we took the ground that mercury, while possessing no properties which exercised any controlling influence upon the blood poison, exerted a somewhat specific influence upon fibrinous exudation. This drug, therefore, I am disposed to regard as affording us better hope of controlling the exudation than any other. It should be administered preferably in the form of calomel or hydrargyrum cum creta in somewhat full doses from the onset of the disease, bearing in mind the tolerance of children for this remedy. For a child five years of age two grains of either of the above preparations should be administered, suspended in milk or some other suitable fluid, every two hours for the first twenty-four hours or until the evacuations are rendered greenish in color and soft in consistency, after which it should be administered at less frequent intervals.

Next in value and importance to the preparations of mercury in this disease we place, without hesitation, tincture of iron. This should be given in glycerine in the proportion of one part to eight, of which to a child five years of age a half-teaspoonful is to be administered every two hours. Given in this form the iron exerts a directly controlling action upon such local exudation as may exist in the fauces. Its systemic effect, however, I think is of even more importance than this, in that I believe this drug to possess certain specific properties in controlling that peculiar blood condition which we have heretofore spoken of as hyperinosis and which exists in so marked a degree in the disease under consideration. The combination of iron with mercurial preparations is perhaps not objectionable, and has been commended by good observers. A better action, I think, of each drug is obtained by administering them alternately rather than in combination.

The indications for treatment, as far as the local exudation in the fauces is concerned, consists in the application of the liquor ferri persulphatis, the membrane being saturated with this drug

applied by means of a pledget of cotton wrapped on a slender probe, and the application repeated every two or four hours, according to the progress of the case.

The further indications for treatment are those dependent upon the local process in the larynx. A fibrinous exudation in the fauces, where it is open to direct inspection and easily reached, can be controlled in many instances by local applications of iron, and perhaps other remedies, in the manner above indicated. When the membrane develops in the larynx, however, a region which is practically not freely open to access for nice manipulation in these cases, and which cannot be easily inspected in young patients, we probably possess no method which is capable of arresting the progress of a fibrinous exudation after it has commenced. We may hope, however, in a small proportion of cases perhaps, to bring about such rapid evolution of the membrane that exfoliation may take place before the patient succumbs from asphyxia. Our main reliance for the accomplishment of this lies undoubtedly in the inhalation of steam, and probably the best method of generating this is by means of slaking lime. The steam which arises during this process of hydrating the lime undoubtedly carries with it small particles of the mineral, which possibly may have some beneficial action upon the exudation. However this may be, clinical teaching seems to indicate that lime inhalations are of undoubted value. It is not necessary that these should be constantly used, but they may be repeated every four to six hours. During the intervals, however, and practically as long as the dyspnœic symptoms persist, the child should be subjected to the action of steam constantly generated from a spirit-lamp. In order to best secure this, it should be covered with a tent, which can easily be arranged by means of sheets and blankets. Whether any additional benefit is derived by adding to the boiling water lactic acid, acetic acid, creasote, oil of tar, camphor, benzoin, cubebs, carbolic acid, thymol, iodine, turpentine, and other drugs, I think is open to question; certainly, in my own experience I have never been able to satisfy myself that these remedies possess any appreciable therapeutic virtues.

In former years, when all pseudo-membranous affections of the throat were designated as croup, emetics were very generally and extensively used in this disease; of late years and since the diphtheritic character of the large proportion of these cases has been recognized, emetics have fallen very largely into disuse, on the ground that the harm that they are liable to do in a disease of such purely asthenic character as diphtheria more than counterbalances any problematical good. That they may occasionally

prove of value in a case of croupous exudation, I think, cannot be questioned. Moreover, when we consider the purely sthenic type of this disease, their use is not so markedly contra-indicated as in diphtheria, and yet even in a case of croupous laryngitis it is doubtful whether they possess any value, other than in enabling a child during the act of vomiting to detach an already loosened false membrane in the larynx and trachea and to expel it. In order that the emetic shall perform this service, it is easy to see that detachment must already in part have been accomplished. It seems clear, then, that an emetic can only be of service when administered at a time when the best judgment and observation seem to indicate a commencing separation of the exudate. In order to be of any value, emetics must be resorted to with great discrimination and nicety of judgment. In selecting an emetic, preference should be given to the yellow subsulphate of mercury, or turpeth mineral. To a child five years of age the dose should not be less than ten grains.

Pilocarpine not only increases diaphoresis through the cutaneous system, but also stimulates the mucous secretions. For this reason Fedder Schmidt[1] resorted to its use in croupus exudations, claiming for it notable success in promoting the separation of the false membrane, an observation which seems to have been confirmed by a number of writers. The remedy is a somewhat powerful one, and should therefore be used with considerable caution. For a child five years of age, probably quite a safe dose would be a twentieth of a grain. This may be repeated at the end of from six to twelve hours, its effect being watched carefully, although Guttman[2] has found the administration of a fiftieth of a grain every hour not excessive.

Notwithstanding our remedial efforts, in a majority of cases the fibrinous exudation continues to develop, and dyspnœic symptoms of an increasingly grave character ensue, when the resort to surgical interference becomes imperative. It is scarcely necessary to add, as stated in discussing the question of tracheotomy in diphtheria, that an early operation gives us the best hope of saving the life of the patient, for I am convinced that the long continuation of laryngeal stenosis, especially in a young child, tends not only to depress the vitality and recuperative power, but also induces conditions in the mucous membrane of the larynx and bronchial tubes which, to an extent, invite the extension of the fibrinous exudation. Considering that here we have to do with an exudation which is neither septic nor especially infectious in character, I think that there can be no question as to the advisability of the use of the

[1] Wiener Klinik, 1889, p. 15.

[2] Berl. klin. Woch., 1880, p. 569.

O'Dwyer tube in preference to tracheotomy. This should be inserted immediately upon the development of any continuous dyspnœic symptoms. If from any cause the tube fails to relieve or is not easily retained in position, resort should be had to tracheotomy. In the very large majority of cases, without doubt, however, of pure croupous laryngitis, the insertion of the O'Dwyer tube should be given the preference over the more radical operation.

CHAPTER XXXV.

PERICHONDRITIS OF THE LARYNGEAL CARTILAGES.

THE morbid changes which take place in the laryngeal cartilages are dependent upon and the result of a morbid process which has its origin in the perichondrium, a primary chondritis, as far as I know, not being met with.

From a clinical point of view, we meet with three varieties of morbid action in these tissues, namely, ossification, fibroid degeneration or chronic inflammation, and acute inflammation.

Osseous degeneration is one of the changes which occur as incident to old age. It gives rise to no clinical symptoms, and it is only of importance as occasionally hampering those operations upon the larynx which involve cartilaginous section at this period of life.

Fibroid degeneration is an exceedingly rare affection, and it also belongs to the late period of life, and is in the majority of instances to be regarded as a manifestation of the strumous diathesis. It gives rise to symptoms not unlike those which attend the acute form of the disease, and differs from it only in the essentially chronic course which it runs. It is probable that many cases of chronic subglottic laryngitis are complicated with this form of perichondrial inflammation. That it may occur in early life is shown by an interesting case recorded by Browne.[1]

Those cases of perichondritis which occur in the course of laryngeal tuberculosis and malignant disease of the larynx should, I think, be excluded from the present consideration, in that they rarely, if ever, assume the aggravated form which the idiopathic disease takes on, their development being, as a rule, masked by the graver symptoms which attend the tubercular and cancerous processes.

Our present consideration has mainly to do with acute perichondritis, which is of much more frequent occurrence than the form above alluded to, and which possesses an especial interest on account of the suddenness of its invasion, the gravity of the symp-

[1] "The Throat and its Diseases," 2d edit., London, 1887, p. 293.

toms which attend its development, the great deformity to which the laryngeal cavity is subjected thereby, and especially the obscurity and difficulty of diagnosis which often confront the surgeon at a time when a prompt and definite diagnosis is a matter of no little importance.

ETIOLOGY.—A large proportion of cases occur idiopathically, namely, as the result of an exposure to cold, while among other exciting causes may be included typhoid fever, diphtheria, pneumonia, erysipelas, syphilis, and traumatism. We include syphilis among the exciting causes of the disease, in that, where it arises from a specific lesion, it runs practically the same course as it does in other cases, although, of course, the indications for treatment are somewhat different.

Of the 33 cases which I have collated, including 2 occurring in my own practice, 9 were idiopathic, 9 were due to the syphilitic taint, 11 followed an attack of typhoid fever, 1 resulted from diphtheria, 1 was traumatic, and 2 were due probably to a lordosis of the cervical vertebræ pressing upon the cricoid cartilage. Flormann[1] observed 3 cases which he attributed to the excessive use of the voice; while Dittrich[2] makes the curious suggestion that the pressure of the cricoid cartilage upon the cervical vertebræ, especially if ossified, as in old age, is liable to develop inflammatory changes, in much the same way as bed-sores develop. This statement would seem to be borne out by 2 cases reported by Stoerk[3] and Gerhardt.[4] Von Ziemssen[5] has seen a case, in which the frequent introduction of the œsophageal sound gave rise to an attack of perichondritis of the cricoid, and believes this is not an infrequent occurrence.

As is the case in most forms of throat disease, men are more frequently attacked than women. In 20 cases collated by Retslag,[6] 16 were men and 4 women.

PATHOLOGY.—The changes which take place in the tissue consist of an increase of the vascularity, together with an augmentation of cell production, and the other changes, which characterize an ordinary attack of acute inflammation. The same morbid changes which have their origin in the perichondrium extend also at a later period to the cartilage itself, supplying an additional element to the marked tumefaction, which characterizes the process. The further changes which take place may consist either in the forma-

[1] "Von einer in Vereiterung übergehenden Halsentzündung." "Sammlung auserlesener Abhandlungen," Leipsic, 1791, Bd. xiv.

[2] Prager Vierteljahrschrift, 1850, Bd. xxvii., p. 117.

[3] "Klinik der Krankheiten des Kehlkopfes," Stuttgart, 1880.

[4] Archives of Laryngol., New York, 1881, vol. i., p. 19.

[5] "Cyclop. of the Practice of Med.," Amer. edit., New York, 1876, vol. vii., p. 816.

[6] Dissert. Inaug., Berlin, 1870.

tion of pus, which, burrowing beneath the perichondrium, separates it from the cartilages beneath, resulting in necrosis of the latter, or, in rare instances, the new cells may become organized, resulting in the development of a true hypertrophic process. This latter form of the disease is that which constitutes more properly a chronic perichondritis.

In most instances the disease primarily attacks, and confines itself to, a single cartilage, although occasionally all the cartilages of the larynx may be involved. Where the arytenoid is attacked, it not infrequently extends to the cricoid. Of the 20 cases which Retslag[1] collated, the cricoid was attacked in 11, the thyroid in 3, the cricoid and epiglottis in 2, the cricoid and arytenoid, and the thyroid and arytenoid, each in 1. Of the 33 cases collated by the author, 23 involved the cricoid, 3 the thyroid, 4 the arytenoid, 1 the cricoid and thyroid, and in 2 cases all the cartilages of the larynx were involved. Schrötter[2] places the order of frequency as follows: First, the arytenoids, then the epiglottis, then the cricoid, and last the thyroid. This is quite true if we include cases which are secondary to tubercular disease. Lüning,[3] in a collation of 55 cases of perichondritis following typhoid, found the cricoid involved in 22, the cricoid and arytenoid in 14, the arytenoid in 9, the thyroid and cricoid in 5, the thyroid, cricoid, and arytenoid in 3, and the thyroid in 2.

SYMPTOMATOLOGY.—The onset of the attack is characterized by a feeling of general malaise, with chilly sensations, and in rare instances by a well-marked chill. This is followed by a certain amount of febrile disturbance, with pains in the bones, headache, and loss of appetite, the thermometer indicating a temperature of from 100° to 101°. The local disturbances, which soon develop, have mainly to do with an impairment of function, which is more or less prominent according to the special cartilage involved. There is a sense of fulness or distention in the parts, together with tenderness on pressure, and in rare instances absolute pain may be a prominent symptom, especially if the disease is of syphilitic origin. As a rule, however, pain is not a prominent feature, either of the specific or idiopathic form of the disease.

The functional disability, which is a prominent symptom in all forms of the disease, has to do with respiration, phonation, and deglutition, more or less notably according to the special cartilage involved.

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[1] Op. cit.

[2] "Vorlesungen über die Krankheiten des Kehlkopfes," Wien, 1887, p. 118; also Wien. klin. Woch., 1888, pp. 25 and 57.

[3] Arch. für klin. Chir., vol. xxx., pp. 225 and 523.

The Cricoid.—If the cricoid cartilage becomes the seat of the disease, the perichondrium lining the inner surface of the cartilage is always involved, giving rise to extensive tumefaction and marked encroachment upon the breathing space, in consequence of which dyspnœa becomes the most prominent symptom, setting in quite early in the attack, and interfering almost equally with inspiration and expiration. If the posterior face of the cartilage is involved, dysphagia necessarily arises, on account of the pressure of the bolus of food on the inflamed tissue. Coincident with the occurrence of dysphagia, the voice becomes lost, or reduced to a hoarse whisper. This is in part due to the inflammatory action extending to the mucous membrane lining the lower portion of the larynx, but in the main is undoubtedly the result of an infiltration of the muscular tissue, thereby impairing the phonatory movements of the cords. This infiltration attacks the crico-arytenoid lateralis muscles more actively than the posticus, although in most instances probably both are to a certain extent involved.

Cough may be present, owing to the accumulation of mucus in the larynx, although this is rarely a troublesome symptom.

The acute symptoms may persist for a few days, when undoubtedly spontaneous resolution may occur, although I have met with no such case, and know of none such reported in literature. As we have seen, the usual course is either toward suppuration or hypertrophic changes. In either case the symptoms persist without much change.

The ultimate result of the morbid process is necessarily the necrosis of the cartilage and the formation of a sequestrum, which, being retained, becomes the source of pus formation, which discharges through fistulous openings either into the larynx or externally. This may be maintained for months or even years, until the sequestrum is finally thrown off or removed.

The Arytenoid.—If the arytenoid cartilage is the seat of the disease, it gives rise to a unilateral tumor, which encroaches upon both the air and food tracts, causing in the latter a certain amount of dysphagia on account of the pressure to which the tissue is subjected in the act of deglutition; while its encroachment upon the laryngeal cavity may cause a certain amount of dyspnœa, although this is rarely an urgent symptom.

In this form of the disease, the crico-arytenoid joint becomes the seat of an effusion, which results practically in an ankylosis, which abolishes the movement of the cord on that side. In this way, the voice becomes hoarse and notably lowered in tone, although not necessarily lost. The ultimate course of events here, in the persistence of symptoms, etc., is practically the same as in

the cricoid disease, although, after the cartilage becomes necrosed, and a fistulous opening is established, the final exfoliation occurs in a much shorter period of time.

The Thyroid.—Perichondritis of this cartilage may involve the inner or outer face of the cartilage and one or both wings; in the large majority of instances, however, the attack involves the inner face, and is usually unilateral. The symptoms to which it gives rise are mainly impairment of voice and interference with respiration. The vocal impairment is due to the coincident involvement of the mucous membrane lining the larynx, in the inflammatory action, and also the swelling of the perichondrium which projects into the cavity in the neighborhood of the ventricular band, thus interfering with the phonatory movements of the cord of the side involved. This, of course, only occurs where the inner face of the cartilage is invaded. If the disease is unilateral, the voice becomes hoarse and lowered in tone. If both sides are involved, phonation is practically destroyed, the voice being reduced to a hoarse whisper. Where the inner face of the cartilage is involved, the area of inflamed tissue becomes somewhat extensive; the tumefaction, therefore, encroaches to a notable extent on the normal breathing space, giving rise to dyspnœa, which in unilateral cases is a source of great distress to the patient, while in cases where both wings of the cartilage are involved, this becomes an exceedingly grave and urgent symptom. Where the disease attacks the outer surface, it results in notable external deformity, usually appreciated by inspection and palpation, while at the same time there is no little tenderness on pressure, and perhaps localized pain.

The involvement of both wings and both faces of the thyroid cartilage practically occurs only in those instances in which all the cartilages of the larynx are invaded, giving rise to a form of the disease which is attended with extensive destruction of tissue, and, as a rule, is followed by the ultimate death of the patient.

Ordinarily, however, an attack of thyroid perichondritis consists in the unilateral development of a localized inflammatory process in the perichondrium of one face of the cartilage, usually the inner. This process goes on to suppuration and the establishment of a fistulous opening, which discharges pus, either into the laryngeal cavity or anteriorly through the cutaneous tissues. This usually occurs near the median line, in either case. After suppuration takes place, the tumefaction subsides to a certain extent, and this is followed perhaps by a slight amelioration of symptoms, although not marked.

The thyroid cartilage is much more abundantly supplied with blood-vessels than either the cricoid or the arytenoid; hence, a

thyroid perichondritis is not liable to result in such extensive cartilaginous necrosis as occurs in the other cartilages. We are more apt to have a superficial necrosis, in which the affected portion disintegrates and is discharged; hence, after a period of a few months or perhaps a year, the suppurative process gradually diminishes, and the parts heal without any serious loss of tissue or permanent impairment of phonation.

The Epiglottis.—This organ, being a fibro-cartilage, never becomes the seat of a process similar to that already described. Perichondritis of this cartilage does not result in an abscess with necrosis, but rather in an ulcerative action; moreover, this is rarely if ever idiopathic, but is only secondary to tuberculosis, syphilis, carcinoma, and other destructive diseases.

DIAGNOSIS.—The suddenness of the onset of the attack, together with the general febrile disturbance which accompanies it, indicates that we have to deal with an acute inflammatory disease. When we consider, therefore, that the only acute inflammatory affections giving rise to dyspnœic symptoms, which are accompanied by febrile disturbance, are perichondritis, croupous exudation, and acute submucous laryngitis, it would seem that the diagnosis in these cases should not as a rule be obscure; and yet, as a matter of clinical experience, the diagnosis is, in the large majority of instances, involved in no little uncertainty, even after the case has been studied and observed for some days.

We leave out of consideration here the question of œdema of the larynx, because, as we have stated, this affection is secondary to some chronic form of disease, and is not attended with febrile movement.

The onset of a croupous laryngitis is generally characterized by more marked chilly sensations, while the febrile disturbance is far more active, the temperature usually running from 102½° to 104°. Moreover, if a croupous exudation is not discovered in the fauces, the laryngoscopic mirror should serve to reveal it. A submucous laryngitis gives rise to a notable tumefaction of an inflammatory character, involving the mucous membrane symmetrically on both sides of the larynx; whereas a perichondritis develops a tumefaction, presenting all the aspects of acute inflammation, which extends more or less to the mucous membrane of the surrounding parts, and yet it is confined, as a rule, to one side of the larynx, and is usually irregular in outline and distinctly asymmetrical. The obscurity in diagnosis lies in part, perhaps, in the fact that one is called to these cases usually in an emergency, and when the examination is made, an uncertainty remains as to whether some obscure growth or malignant disease may not have existed, without giving

rise to symptoms, for some time before the development of the acute attack.

Our diagnosis, therefore, must be based on the exclusion of other acute affections, and the character of the febrile disturbance, together with ocular inspection by the laryngeal mirror. If the cricoid is involved, there will be found a distinct tumefaction, irregular in outline, nodular in character, projecting into the subglottic portion of the larynx and encroaching upon the breathing space, as seen in Fig. 65. The whole aspect of the case indicates an acute inflammation which involves the mucous membrane covering the tumor and extends to the parts above the glottis. While the tumor is practically below the cords, it gives the appearance of projecting somewhat into the supraglottic larynx, crowding up the arytenoid and vocal cord in such a way that the latter is brought into apposition with the ventricular band, thus more or less completely obliterating the ventricle. The movements of the larynx on the side affected are also notably hampered or practically abolished.

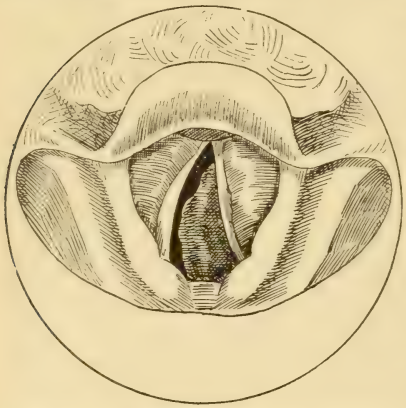

FIG. 65.—Laryngoscopic Image in Perichondritis of the Cricoid Cartilage.

One's first impression, on examining a case of this kind, is of a very extensive distortion of the laryngeal cavity; a careful study, however, of the regional anatomy by means of the laryngeal mirror should aid one materially to outline the distinct tumefaction, having its origin on the posterior segment of the cricoid, which is the part primarily involved in the large majority of cases.

If one of the arytenoid cartilages is the seat of the attack, the laryngeal examination shows us an extensive tumefaction, covering this cartilage, with all the appearances of an active acute inflammation. The only condition with which this may be confounded is that of tuberculosis; this latter in most instances is bilateral, while idiopathic perichondritis is almost invariably unilateral. Moreover, a careful examination will reveal the condition in the one case to be purely inflammatory, by its diffuse bright red color; and in the other, the minute whitish-gray points, scattered through the paler grayish-pink membrane, will indicate the presence of tubercle, as already described in the chapter on that disease.

If the thyroid cartilage is involved externally, the condition should be recognized by palpation and inspection, together with

the careful analysis of general and local symptoms. Where the inner face is involved, it gives rise to a distinct circumscribed tumefaction, which the laryngeal mirror demonstrates as projecting directly into the laryngeal cavity, usually in the neighborhood of the ventricular band, which is crowded forward in such a way as to encroach somewhat on the breathing space, while the true cord is practically hidden by the tumefaction above it. The whole appearance is one of active acute inflammation which involves not only the mucous membrane covering the tumefaction, but extends somewhat to surrounding tissues. The local inflammatory action, as a rule, should serve to eliminate the question of malignant or other neoplasms, which are practically the only affections with which this disease might be confounded.

As we see, therefore, a thyroid or arytenoid perichondritis ought to be recognized with comparative ease, while that form of the disease which is the most frequent, viz., that in the cricoid cartilage, is the one whose recognition involves the greatest difficulties. Even here, however, as before stated, I think a diagnosis will be rendered much more simple by the eliminations above indicated and a careful analysis of the general symptoms and the local appearances.

PROGNOSIS.—These cases run a somewhat protracted course, and yet they involve no special tendencies toward a fatal termination, other than as the result of laryngeal stenosis, which, of course, can be obviated by the prompt introduction of a tracheal tube. In those rare cases, however, in which all the cartilages of the larynx are involved, the prognosis is exceedingly unfavorable, in that death almost invariably results in the course of a few months. These cases of general invasion of the laryngeal cartilages are usually secondary to tuberculosis, carcinoma, or some other systemic disease, and hence, while the cartilaginous affection is a contributing cause, it is not always to be regarded as the active cause of the fatal issue.

The course and prognosis in a case of cricoid perichondritis is fairly well illustrated in the following two instances, which came under my own observation:

CASE I. A. M. J., aged 27, consulted me July 12th, 1889, with the following history: At about the age of 18 he had a venereal sore, which, however, had never been followed by a cutaneous eruption or other specific manifestations. During the summer of 1888 he had several attacks of severe cold, with hoarseness. In one of these attacks, in July, 1888, the hoarseness increased at the end of two weeks, and dyspnœa set in, which necessitated tracheotomy a month after the commencement of his hoarseness. When I first saw him, he had worn the tube for nearly a year. Laryngeal examination showed a diffuse swelling beneath the cords which was quite prominent on the left side and projected into the breathing space, the membrane covering it being of a dark

red color. The whole larynx was twisted somewhat toward the left, while the cords were in the median line, and the arytenoids movable in but a limited degree. This patient was put under specific treatment without any notable effect. In November, 1889, on removing the tube for investigation, a freely movable sequestrum was observed on the upper side of the tracheal opening, which was evidently a necrosed cricoid cartilage. A few days later the patient was anæsthetized, the tracheal opening enlarged, and the sequestrum taken out in two pieces. When put in apposition, the two fragments made up a segment of nearly three-fourths of a ring. The necrosed cartilage was removed sixteen months after the primary attack. This patient is still under observation, and compelled to wear his tube, the respiration not having been improved, although phonation is notably better. This last is accounted for by the fact that the general tumefaction of the mucous membrane, which resulted from the presence of the sequestrum, has disappeared, and also that the movements of the cords have improved by exercise. The dyspnœa has persisted, on account of the extensive deposit of connective tissue around the necrosed cartilage, which has left a permanent tumefaction, projecting into the subglottic larynx, and which has hitherto resisted treatment.

Case II. This was a man aged 26, who consulted me January 8th, 1885, with the following history: He had always enjoyed excellent health, and had never had any venereal disease. On August 20th, 1884, as the result of a cold, he had an attack of sore throat, with hoarseness. This increased, and in a few days dyspnœic symptoms supervened. On September 7th tracheotomy became necessary. On September 27th he was so much better that the tube was removed, although on the 30th it became necessary to reinsert it. When I first saw him, he had worn this tube four months. An examination showed the whole lining membrane of the larynx, including the vocal cords, deeply injected and of a bright red color. Both cords were practically immovable, the right being in the cadaveric position, while the left was near the median line. Beneath the cords, a distinct tumefaction was seen projecting from the left side of the cricoid cartilage, and nearly filling the subglottic portion of the larynx. A passage could be seen immediately beneath the anterior commissure, through which a limited amount of air could be forced when the tube was closed.

Notwithstanding the absence of a specific history, this patient was put on full doses of iodide of potassium. The patient was seen at intervals of a few weeks, and six months later the voice, which had hitherto been husky and raucous, had become quite clear, an increased amount of air could be forced through the larynx, and the swelling and redness of the mucous membrane had completely disappeared. He was directed now to make use of the Luer valve, by the use of which the movements of the cords increased. On April 15th, 1886, he expelled through the natural passages a sequestrum, which was evidently a segment of the cricoid ring. This was followed by notable improvement in all his symptoms, and on May 17th the tube was removed, his breathing being easy and his voice quite clear. Examination revealed a band of cicatricial tissue extending across the side of the subglottic larynx, and just visible on inspiration.

In the latter of these cases, the ultimate result of the disease was the complete restoration of both the voice and a practically normal breathing space. In the former case, on the other hand, while the voice became improved after the removal of the seques-

trum, the dyspnœa persisted to such an extent as to demand the retention of the tracheal tube. While, therefore, the disease is not fatal, the ultimate result as to the voice and respiration becomes an interesting question in prognosis. No definite suggestions can be made on this point for any given case, and yet the exceeding great danger of permanent respiratory obstruction is shown by the fact that of 70 cases compiled by Lüning[1] which survived tracheotomy, in 60 the permanent wearing of the tracheal tube became necessary. It should be remembered, however, that these were all cases which followed typhoid fever, persistent laryngeal stricture being particularly characteristic of that form of the disease which follows typhoid.

Cases of thyroid perichondritis run a somewhat more rapid course than cricoid. The sequestrum which forms is liable to disintegrate, and be expelled through the natural passages, or a large sequestrum may form, which demands operative interference. One of the remote dangers which this form of disease involves, according to Schrötter,[2] is the burrowing of pus beneath the deep tissues of the neck, into the anterior mediastinum, giving rise to suppurative inflammation in this space.

The arytenoid form of the disease results in a destruction of the cartilage, which is ordinarily expelled through the natural passages. The prominent result is usually a permanent ankylosis of the crico-arytenoid joint, which gives rise to a certain amount of vocal impairment. The principal danger of this form of disease is in its extension to the cricoid.

TREATMENT.—The treatment of the acute stage of the disease consists of active general and local antiphlogistic measures. Most important of these, perhaps, are ice-packs, or Leiter's coil, applied externally, together with the internal administration of pellets of ice, and local blood-letting by means of leeches or wet-cupping. Schrötter[3] suggests the use of absorbents, such as mercurial ointment, iodoform or iodol ointment, applied externally, or a solution of iodine and glycerin applied to the mucous membrane of the larynx. If the pain is great, Magendie's solution of morphine or a ten-per-cent solution of cocaine may be sprayed into the laryngeal cavity.

In addition to the above, the bowels should be acted upon freely by the administration of a full dose of either blue mass or calomel, followed by a mild saline cathartic.

Iodide of potassium, I think, should be administered in all

[1] Arch. für klin. Chir., vol. xxx., pp. 225 and 523.

[2] "Vorlesungen über die Krankheiten des Kehlkopfes," Wien, 1887, p. 125.

[3] Loc. cit., p. 127.

cases, whether a specific history is elicited or not, in that even in cases where there is no specific taint, a certain amount of action can be anticipated from this drug in perichondrial inflammations. This may be given at the onset of the acute stage, and persisted in for a considerable period after the acute symptoms have subsided.

Our later treatment of perichondrial inflammation consists in measures for the relief of the dyspnœa, the performance of tracheotomy when demanded, the management of the sequestrum, and finally, the relief of the resulting stenosis. When it becomes necessary to open the air passages, laryngotomy should be done in preference to the low operation, in that this not only secures a certain amount of local blood-letting, but also leaves an opening through which access can be more readily obtained to the sequestrum in the case of cricoid perichondritis, and to purulent accumulations which may form in case the thyroid is the part involved.

The case should be watched for the formation of a sequestrum, and measures taken to remove this as soon as it has become detached from the diseased perichondrium. The presence of the sequestrum undoubtedly stimulates connective-tissue formation the longer it remains; therefore, the more extensive is the permanent deformity and stenosis which may be anticipated. Its early removal, therefore, becomes a matter of no little importance.

A cricoid sequestrum may be removed through the tracheal opening, although a much safer procedure would be to enlarge the opening either vertically or laterally. A safer procedure still, perhaps, would be the reinsertion of the tube lower down, especially if the sequestrum is large. In a case reported by Hjort,[1] a large thyroid sequestrum was removed by thyrotomy.

One of the most important measures for the preservation of the voice and restoration of the breathing space, I think, consists in the use of a Luer valve in connection with the tracheal tube. This is especially valuable where there is ankylosis of the crico-arytenoid joint, as considerable motion results from the forcible expiration which is accomplished by this device.

The severing of the adhesions by the intra-laryngeal knife, and the dilatation of strictures by bougies, are indications which may be carried out in individual cases. At best, a laryngeal stricture following a perichondritis is a condition which, as we have seen before, will often baffle our most skilful efforts. The extreme measures which may become necessary are well illustrated by Heine's[2] case, in which a large portion of the larynx was extirpated and an artificial organ introduced, to the great comfort and relief of the patient.

[1] Norsk Magazin f. Lägevidenskaben, July, 1886.

[2] Arch. für klin. Chir., vol. xix., p. 514.

CHAPTER XXXVI.

LARYNGEAL HEMORRHAGE.

UNDER this term we include cases of rupture of the blood-vessels of the larynx, with escape of blood into the submucous tissues, giving rise to hæmatomata, and also those in which the blood escapes through the surface of the mucous membrane, causing an hæmoptysis. We exclude those cases in which the hemorrhage is merely symptomatic of a syphilitic or tubercular ulcer, malignant disease, the presence of a foreign body, etc.

In former days all cases of hæmoptysis were generally considered as indicative of pulmonary disease: the introduction of the laryngoscope, however, enabled observers to recognize the laryngeal mucous membrane as a not infrequent source of hemorrhage. Thus, as early as 1862 we find Semeleder[1] reporting two cases of hæmoptysis in which the laryngoscopic examination revealed the source of the bleeding to be in the ventricular band. Following this, we have cases of laryngeal hemorrhage reported by Lewin,[2] Navratil,[3] Mandl,[4] Tobold,[5] and others.

ETIOLOGY.—A reading of reported cases would lead us to infer that in the majority, if not in all, instances the disease accompanies an attack of acute laryngitis; the suggestion being that the hemorrhage is a symptom of an inflammatory process. Thus, Mackenzie,[6] in his chapter on Acute Laryngitis, refers to this affection as an occasional accompaniment of this disease. Gottstein[7] also treats it in a similar manner, while Browne[8] speaks of it as the precursor or sequela of the inflammatory process. Navratil[9] reports his case as one of chorditis hæmorrhagica, while the disease is described under the heading Laryngitis Hæmorrhagica by Strübung,[10] Stepa-

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[1] "Rhinoscopy and Laryngoscopy," Amer. edit., New York, 1866, p. 103.
[2] "Die Inhalationstherapie," 2d ed., Berlin, 1865, p. 328.
[3] "Laryngologische Beiträge," Leipsic, 1871, p. 18.
[4] "Traité pratique des Maladies du Larynx," Paris, 1872, p. 644.
[5] "Laryngoscopie und Kehlkopf-Krankheiten," Berlin, 1874, p. 142.
[6] "Diseases of the Throat and Nose," Amer. edit., Phila., 1880, vol. i., p. 271.
[7] "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 82.
[8] "The Throat and Nose and their Diseases," 3d edit., London, 1890, p. 270.
[9] Loc. cit. [10] "Die Laryngitis hämorrhagica," Wiesbaden, 1886.

now,[1] Fränkel,[2] Boecker,[3] Burow,[4] Lastra,[5] Rethi,[6] Lanz,[7] Massucci,[8] Coomes,[9] Garel,[10] Bloch,[11] Srebny,[12] Favitzki,[13] La Placa,[14] and Casadesus.[15]

While many of the above writers do not regard the disease as a variety of laryngitis, yet the use of the term laryngitis hæmorrhagica would seem to suggest that inflammation of the mucous membrane lining the larynx forms an essential part of the affection. When we consider the very great frequency of a catarrhal laryngitis and the exceeding rarity of hemorrhage of the larynx, I think we are forced to the conclusion that a simple inflammatory process is not a direct nor even an actively predisposing cause of hemorrhage; and while, as Browne states, it may be a sequela, it is not to be regarded as a precursor of the attack.

I prefer the term "laryngeal hemorrhage" as used by Hartman,[16] Wagner,[17] Gleitsmann,[18] Ruault,[19] Smith,[20] Ingals,[21] and Morgan,[22] in that this defines the prominent feature of the disease, without involving the somewhat misleading suggestion that the hemorrhage is induced by any special local lesion, inflammatory or otherwise.

A careful study of the reported cases would seem to indicate that general conditions have quite as much influence in causing the attack as local lesions. Among these general conditions are to be noted the hemorrhagic diathesis, as was present in several of Rethi's[23] cases, as well as in those reported by Massucci,[24] Coomes,[25] Jurasz,[26] and Garel;[27] cirrhosis of the liver and dilatation of the

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[1] Monatschrift für Ohrenheilkunde, 1884, vol. xviii., p. 1.
[2] Berliner klin. Woch., 1874, vol. xi., p. 16.
[3] Ibid., p. 179.
[4] "Laryngoscop. Atlas," 1877.
[5] Rev. de Med. de Sevilla, 1887, vol. xi., No. 1.
[6] Wien. med. Presse, 1884, vol. xxv., pp. 1145 and 1178. Internat. klin. Rundschau, 1887, vol. iii., pp. 799, 841, 921, and 999.
[7] "Medic. obors.," 1885, vol. xxiv., No. 14.
[8] Giornale internazionale delle Scienze mediche, Naples, 1885, vol. vii., p. 562.
[9] "Medical Progress," Louisville, vol. i., p. 30.
[10] Revue mensuelle de Laryngologie, d'Otologie, etc., 1887, vol. vii., p. 248.
[11] Wien. med. Presse, 1887, vol. xxviii., p. 1136.
[12] Gazeta lekarska, 1888, No. 38.
[13] Monatschrift für Ohrenheilkunde, 1889, vol. xxiii., p. 121.
[14] Archiv d'Ital. di Laryngol., 1888, vol. viii., p. 156.
[15] Rivista di Laryngo-, Oto-, y Rinologia, March, 1889.
[16] Trans. Amer. Laryngolog. Ass'n, 1879, p. 275.
[17] Ibid., p. 279.
[18] Amer. Jour. Med. Sciences, 1885, vol. lxxxix., p. 396.
[19] Centralblatt für Laryngologie, 1890, vol. vi., p. 323.
[20] Arch. of Laryngology, vol. i., p. 65.
[21] Jour. Amer. Med. Ass'n, 1884, vol. iii., p. 541.
[22] New York Med. Record, 1885, vol. xxvii., p. 317.
[23] Loc. cit.
[24] Loc. cit.
[25] Loc. cit.
[26] Deut. med. Woch., 1879, No. 15.
[27] Loc. cit.

heart, as in Favitzki's [1] case; the general debility of phthisis, as in one of Stepanow's [2] cases; and anæmia and malnutrition, as in Browne's [3] case. Ruault's [4] case was due to vicarious menstruation; in Fränkel's [5] case, pregnancy seems to have exercised an influence. While in perhaps a majority of cases, some general condition can be found to account for the local hemorrhage, in many instances the attack comes on while the patient is in the enjoyment of perfect health. In these instances, it is often difficult to ascertain the real cause of the bleeding. Whether this may lie in some local condition which weakens the walls of the blood-vessels of the larynx can only be the subject of speculation. Slight erosions in the larynx undoubtedly may occur, and be the site of ruptured blood-vessels and consequent hemorrhages. These, of course, are not ulcerations, for, as Virchow [6] has shown us, ulcers never occur as the result of a catarrhal inflammation; erosions, however, may occur, but this only in a part covered by pavement epithelium.

We reach the conclusion, therefore, that a chronic laryngitis may act as a predisposing cause of laryngeal hemorrhage after having given rise to slight erosions in the mucous membrane. There are, however, but few localities in the upper air tract where erosions occur: one of these is on the anterior face of the arytenoids, and in many instances the escape of blood has been traced to this point.

Among the exciting causes of the attack may be noted the straining of the voice in excessive use, especially where it has been weakened from any cause: thus, in a case reported by Schnitzler [7] the patient was suffering from diphtheritic paralysis, and the excessive effort which phonation entailed excited a hemorrhage from the larynx. Coughing, vomiting, straining, violent exercise, and other acts which induce superficial plethora may also lead to a rupture of the laryngeal blood-vessels. That an acute laryngitis may in rare instances prove the exciting cause is illustrated in Fränkel's case, where a hemorrhage seemed to be the direct result of the laryngeal inflammation.

PATHOLOGY.—The escape of blood may be either beneath the surface, constituting an extravasation, or the hemorrhage may be the result of a rupture of blood-vessels on the surface of the mucous membrane, giving rise to an hæmoptysis.

It usually occurs over a somewhat limited area or even at a single point.

As we have already seen, it does not occur as the result of pre-

[1] Loc. cit. [2] Loc. cit. [3] Op. cit., p. 271.
[4] Loc. cit. [5] Loc. cit. [6] Berl. klin. Woch., 1883, Nos. 8 and 9.
[7] Wien. med. Presse, 1880, Nos. 38 and 41.

disposing local causes, but is rather a diapedesis. In other words, the hemorrhage occurs as the result of a previously existing condition, either of the blood itself or of the walls of the blood-vessels. Hence, it may arise from any portion of the laryngeal cavity, although it occurs either from the ventricular bands or true cords, as a rule.

If it is the result of an erosion of the mucous membrane, this is most likely to occur at the posterior insertion of the cords or on the anterior face of the arytenoid cartilage.

According to Brown-Séquard,[1] vasomotor disturbances of the mucous membrane may constitute a prominent predisposing pathological condition.

Of course an opportunity for a careful investigation of the local condition is rarely afforded, in that the disease is probably never fatal. In Favitski's[2] case, however, the patient died of natural causes, and the parts were subjected to most minute investigation, which revealed vascular plethora, with an extravasation of red blood-corpuscles, thus clearly indicating diapedesis, which in this case was the result of cirrhosis of the liver and cardiac dilatation.

SYMPTOMATOLOGY.—If the case is one of simple extravasation or concealed hemorrhage, the symptoms consist of a sense of irritation in the larynx, with a possible disposition to cough, and alteration or loss of voice, dependent upon the size and location of the hæmatoma. If this is sufficiently large to encroach in any degree upon the breathing space, we have the additional symptom of dyspnœa.

If the hemorrhage is an open one, of course the first and prominent symptom which manifests itself is hæmoptysis. The blood comes up easily, and with a slight effort at clearing the throat. It appears in small masses or streaks unmixed with saliva or mucus, which distinguishes it to a certain extent from pulmonary hemorrhage, although in color its appearance is similar to that from the deeper tissues. Where it is small in amount, it may lodge in the larynx and become clotted, in which case it is expelled, of course, in the form of dark-colored masses. It is usually somewhat persistent in character, and may continue for days without great variation in amount.

A profuse hemorrhage from this region is quite rare, although in both Stepanow's and Fränkel's cases it was considerable in amount, while in Hartman's case the attack was ushered in by the loss of from two to three ounces. This was attended with a sense of choking and suffocation.

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[1] Cited by Rethi: Loc. cit. [2] Loc. cit.

Dyspnœa is rarely present, unless the blood lodges in the larynx and forms a clot sufficiently large to encroach upon the breathing space.

Diagnosis.—The important element of diagnosis is in determining whether the source of the hemorrhage be from the lungs or the upper air tract. Instances are by no means rare in which hemorrhage from the nose or naso-pharynx has given rise to an hæmoptysis, the blood trickling down to the lower part of the pharynx, or even into the larynx, and being subsequently expectorated. It becomes important, therefore, not only to make a laryngoscopic, but a rhinoscopic, examination, as determining whether the parts above may not be the source of the bleeding. In probably a large majority of instances the careful use of the laryngoscope will determine whether the source of the hemorrhage is in the larynx or in the parts below, in that, as a rule, the trachea can easily be inspected, and in a pulmonary hemorrhage this is found coated with blood as far down as the bifurcation, whereas in a laryngeal hemorrhage it is an exceedingly rare event for the blood to make its way into the trachea. Furthermore, the examination should reveal the immediate source of the hemorrhage in some portion of the laryngeal mucous membrane. Additional evidence is established, of course, by an examination of the lungs. Furthermore, in pulmonary hemorrhage, the blood is usually thoroughly admixed with mucus, while in a laryngeal hemorrhage it is entirely distinct. If the blood is expectorated in inspissated or dry clots, this would always indicate the larynx or the parts above as its source.

If the case be one of concealed hemorrhage, the laryngoscope should always serve to make the diagnosis clear. This will reveal a rounded, deep red or purplish tumor projecting from one or the other walls of the larynx, and presenting the ordinary gross appearances of an hæmatoma so clearly that the possibility of a mistaken diagnosis between that and a neoplasm or œdema of the glottis need scarcely be anticipated. While concealed hemorrhage in the larynx is a very rare accident, the possibility of such an occurrence should always be borne in mind in connection with any sudden attack of dyspnœa referable to the upper air passages.

Course and Prognosis.—When we consider that a laryngeal hemorrhage is a diapedesis, or the result of a general blood condition, we can easily understand how an attack may persist for days and even weeks. It involves, however, in itself, no very grave danger to life. As far as I know, a fatal case of hemorrhage of this kind has never been reported.

Its long continuance necessarily becomes a source of apprehension and alarm to the sufferer, although as the bleeding continues it shows no disposition to increase in amount, nor is a slight hemorrhage from this source to be regarded as the possible precursor of a severe or dangerous hemorrhage; and even in those cases in which its cause is established in the hemorrhagic diathesis, cirrhosis of the liver, or cardiac disease, clinical observation teaches us that this involves no possible danger of a pulmonary hemorrhage ensuing.

TREATMENT.—If the case is one of concealed hemorrhage or hæmatoma in which the tumor is sufficiently large to give rise to notable symptoms, the mass should be opened by an incision sufficiently large to allow the clot to be turned out and voided. This may be done without hesitation, in that such procedure involves no special danger of setting up further hemorrhage from the same vessel. If the mass is small and gives rise to no especial symptoms, it may safely be allowed to remain and undergo absorption by the natural processes. In those cases in which there is open hemorrhage, the loss of blood is generally easily controlled by the local application of some simple and unirritating astringent, as follows, and somewhat in the order of preference:

Ferri et aluminis sulphas, . .	grs. x. to the oz.
Liquor ferri persulphas, . . .	℥x. to the oz.
Acidum tannicum, ...	grs. xx. to the oz.
Argenti nitras, ...	grs. v. to the oz.

The application should be made preferably by means of the laryngeal atomizer, and repeated once or twice daily, according to the severity of the attack.

The use of the voice should be interdicted, and the patient directed to avoid all exercise, as far as possible, while at the same time the food should be bland and unirritating. Warm or highly seasoned food and drinks should be forbidden. Pellets of ice held in the mouth, or ice applied externally to the neck, will be found especially serviceable.

If the cough is troublesome, or the disposition to clear the throat, as the result of the laryngeal irritation, is not controllable, opiates should be administered with a certain amount of freedom. The use of tobacco or alcoholic stimulants is of course to be avoided.

The internal administration of ergot, preparations of iron, sulphuric acid, and those remedies which are supposed to have a systemic effect on hemorrhage may be given, if the amount of blood

lost becomes in any degree serious, although, as a rule, the action of these remedies is not greatly to be depended upon.

If the hæmoptysis shows any indication whatever of periodicity, quinine should be given in full doses, for while a laryngeal hemorrhage is not to be regarded as a manifestation of malaria, yet any poisoning of this nature which may exist undoubtedly serves to temporarily aggravate the trouble.

CHAPTER XXXVII.

SYPHILIS OF THE LARYNX.

THE manifestations of this disease which are met with in the larynx are: 1st, The primary lesion; 2d, Erythema; 3d, The mucous patch; 4th, The superficial ulcer; 5th, The gummy tumor; 6th, The deep ulcer; and 7th, Cicatricial stenosis.

As regards the comparative frequency of syphilitic invasion of the larynx, Fournier[1] finds that from 3% to 5% of all his cases developed a laryngeal lesion; while Lewin,[2] out of 20,000 syphilitic cases, found the larynx involved in 2.9%. Willigk,[3] in 218 autopsies on syphilitic cases, found the larynx involved in 33. In these cases, the specific disease must be regarded as probably either the active or contributing cause of death, and hence these statistics are fairly indicative of the gravity of the laryngeal manifestation; although Engelsted,[4] in 521 autopsies, found the larynx involved in but 25 instances.

As regards the frequency of throat syphilis, in comparison with all forms of throat disease, Schrötter,[5] in 58,170 cases, found 1,378 suffering from syphilitic disease of the throat, or nearly 2.4%; while Mackenzie,[6] in 10,000 cases, met with 308 cases of throat syphilis, or 3.4%.

THE PRIMARY LESION.

As far as I know, but a single case of chancre of the larynx has been reported. This was an instance observed by Moure[7] in a young man twenty-two years of age, in whom the sore made its appearance on the free border of the epiglottis, on the left side. It was followed soon by secondary manifestations, and seems to have presented no local features which differed essentially from an ordinary buccal chancre.

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[1] "Leçons sur la Syphilis," Paris, 1873, p. 578.

[2] Cited by Gottstein: "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 263.

[3] Prag. Vierteljahresschrift, 1856, vol. xxiii., pt. 2, p. 20.

[4] Virchow und Hirsch: Jahresbericht, 1868, vol. ii., p. 585.

[5] "Vorlesungen über die Krankheiten des Kehlkopfes," Wien, 1887, p. 176.

[6] "Diseases of the Throat and Nose," Amer. ed., Phila., 1880, vol. i., p. 347.

[7] "Leçons sur les Maladies du Larynx," Paris, 1890, p. 229.

Erythema of the Larynx.

This manifestation of syphilis belongs to the earlier or what is usually termed the secondary stage of the disease, and may develop as early as from four to six weeks after the primary lesion, although it occurs usually from the fourth to the sixth month. In rare instances its appearance may be delayed as late as two years or even later.

From a pathological point of view, it is closely analogous to the cutaneous erythema, but it is not usually coincident with it, being more liable to develop after the cutaneous eruption has subsided. Like all syphilitic invasions of the larynx, it comes on somewhat insidiously and without marked subjective symptoms. If the vocal cords are involved, the voice is apt to be impaired or perhaps completely lost. There is no localized pain or difficulty in deglutition; in fact, both the subjective and objective symptoms are confined to a certain amount of impairment of function. Browne[1] alludes to the raucous syphilitic voice in this connection. I am disposed to think that the peculiarly harsh voice of syphilis which we usually designate as "raucous" belongs more especially to the later and graver lesions which produce notable distortion of the organ.

Pathology.—The essential pathological lesion which constitutes this manifestation of syphilis consists in a more or less dense infiltration of the mucosa with embryonic or round cells, giving rise to a certain amount of swelling of the tissue, but the most marked change which seems to result from this infiltration consists in an interference with the return circulation of blood, whereby there results a notable amount of venous turgescence. This infiltration may diffuse itself somewhat equably through the lining membrane of the larynx, giving rise to a uniform hyperæmia, or in rare instances it may be distributed in circumscribed areas, thus occasioning an irregular vascular plethora, which gives to the membrane a somewhat mottled appearance. We can thus easily appreciate the characteristic difference between an acute catarrhal inflammation of the laryngeal membrane and a syphilitic erythema, in that the first change which occurs in the inflammatory process consists of vasomotor paresis and the dilatation of blood-vessels. This is followed by cellular infiltration, the whole process being directed by certain influences exerted upon the vasomotor centres. In the syphilitic disease, on the contrary, the cellular infiltration comes first, and the vascular disturbances are secondary. The mucous membrane on the posterior surface of the epiglottis and

[1] "The Nose and Throat and their Diseases," 3d ed., London, 1890, p. 380.

of the ventricular bands and ary-epiglottic folds is usually involved, while in rare instances the vocal cords themselves are invaded. Fournier[1] describes a protoplastic form of this disease which seems to be due to a more extensive and deeper infiltration of the membrane, as the result of which the parts are much more swollen and the subjective symptoms more prominent, although dyspnœa or difficulty in swallowing does not occur. In this form, localized prominences are occasionally observed, constituting what by some writers have been regarded as vegetations.

DIAGNOSIS.—It is a somewhat nice question to decide in any given case that a laryngeal hyperæmia is due to syphilis, and yet there is something in the appearances of the mucous membrane in a syphilitic erythema, both in the larynx and pharynx, which is always suggestive of a specific source. Our main reliance in diagnosis by ocular inspection lies in the peculiar dusky, sombre hue of the membrane, which is of a dark red, somewhat purplish tint, in contradistinction to the bright red, scarlet color which is characteristic of an acute idiopathic inflammation. If the infiltration occurs in circumscribed areas, giving rise to that peculiar mottled appearance in the membrane already described, the evidence of a specific taint should be more clearly recognizable. In this form of the disease we still have the diffuse venous turgescence, with its dark red or purplish color, but this is intensified in circumscribed areas, varying in diameter from one to four lines. The hyperplastic form, with its characteristic color and its extensive and uniformly diffused swelling, should not easily be mistaken for any simple inflammatory process either of the mucous membrane or the perichondrium. Aside from the above considerations, we have no definite method of recognizing a syphilitic erythema other than by the clinical history of the case and the success of internal medication.

COURSE AND PROGNOSIS.—The disease is one which disappears promptly and quickly under the influence of appropriate constitutional treatment. When not subjected to treatment, however, it may remain for weeks or even months without undergoing further changes. In other words, there is nothing in the pathological condition which constitutes what we have designated as erythema which tends to develop any of the later or graver manifestations of syphilis. I cannot agree with Türck[2] in the statement that a high degree of stenosis of the larynx may develop in this form of the disease. Van Harlingen[3] states that when the epiglottis is involved

[1] "Leçons sur la Syphilis," Paris, 1873, p. 580.

[2] Zeissl: "Lehrbuch der Syphilis," Stuttgart, 1875, vol. ii., p. 213.

[3] "International Encyclop. of Surgery," New York, 1888, vol. ii., p. 425.

it may become greatly tumefied and œdematous. I am disposed to think that the occurrence of such a symptom should be regarded as evidence of some graver lesion.

The Mucous Patch.

This lesion, like the former, belongs to the secondary stage of syphilis and is one of its exceedingly rare manifestations in the larynx; indeed, by many observers the possibility of its occurrence has been questioned, notably by Isambert.[1] That it may develop, however, in this region cannot be doubted, in view of the fact that instances of this sort have been recorded by many and competent observers. Fournier,[2] in his unusually large experience, reports having seen two or three cases. Whistler,[3] in a record of 170 cases of syphilis, 88 of which were in the secondary stage, met with mucous patches in the larynx in 24. Gerhardt and Roth,[4] out of 54 cases of secondary syphilis of the larynx, met with 8 instances of this lesion. Krishaber and Mauriac,[5] in 14 cases of laryngeal syphilis in the secondary stage, found 10 instances of mucous patch. Additional instances have been observed by Gougenheim,[6] Beverley Robinson,[7] and Martel.[8]

It may occur as early as six weeks after the primary invasion, or its appearance may be delayed for twelve months or even longer.

Its most frequent site is on the upper surface of the vocal cords. Next in frequency it appears on the epiglottis, the arytenoids, and the ventricular bands. In Whistler's cases the vocal cords were involved in eleven cases, the epiglottis in nine, the arytenoids and commissure in five, and the ventricular bands in two instances.

It gives rise to no pronounced symptoms other than those which may depend on its location. If the cords are affected, the voice is impaired; while if the patch appears near the free border of the epiglottis, some slight pain in swallowing is experienced. Its manifestation in the larynx differs in no essential degree from that observed in other portions of the mucous tract. In other words, it seems to set up no secondary inflammatory changes.

The pathological lesion which constitutes a mucous patch has already been fully discussed elsewhere.[9] It consists merely in an infiltration of the epithelial layer of the mucous membrane with

[1] Annales des Mal. de l'Oreille, 1876, vol. ii., p. 227. [2] Op. cit., p. 583.
[3] "Lectures on Syphilis of the Larynx," London, 1879, p. 28.
[4] Virchow's Arch., 1861, vol. xx., p. 402.
[5] Annal. des Mal. de l'Oreille, 1875, p. 58.
[6] Gaz. des Hôpit., 1881, pp. 474 and 489.
[7] New York Med. Record, 1878, vol. xiv., p. 516.
[8] Annal. des Mal. de l'Oreille, 1881, vol. vii., p. 142. [9] P. 267.

embryonic cells. It seems to manifest the same tendencies here as observed elsewhere, both in its persistency and tendency to recurrence. It may occur single or the lesion may be multiple.

Diagnosis.—The main interest of this lesion of syphilis has to do with the question of diagnosis. The mucous patch in the larynx should be recognized by the same appearances which are characteristic of a similar manifestation of syphilis in other portions of the air tract. If the parts are brought under ocular inspection, we recognize the small peculiar grayish patch slightly elevated above the surface and standing out in somewhat notable relief from the mucous membrane surrounding it, which is liable to present a moderate amount of increased redness in the form of an areola.

The Superficial Ulcer.

This lesion of syphilis belongs also to the secondary stage of the disease, and occurs usually from two to seven years after the primary sore. It may develop from a mucous patch or be primarily the result of the breaking down of a superficial gummatous infiltration.

The clinical features and pathology of this form of ulceration have already been so fully discussed in the previous chapters on syphilis of the nose and pharynx that it is not necessary to enter on the consideration of the disease here further than to state that a laryngeal ulcer of this variety presents the same general features and runs much the same course as in the parts above.

It gives rise to no notable symptoms and causes no very rapid destruction of tissue. There is necessarily a certain amount of impairment of vocal function in the organ, dependent upon the extent of the ulcerative process; there is also a secretion of muco-pus, tinged perhaps with blood; but cough, localized pain, difficulty in deglutition, etc., are rarely present; indeed, the laryngeal invasion is apt to be somewhat insidious, making its presence known mainly by the vocal impairment. Whistler[1] speaks of this lesion as "relapsing ulcerative laryngitis," in that its clinical history is marked by frequent recurrences or exacerbations. The presence of the ulcerative process necessarily sets up a catarrhal inflammation in the mucous membrane, which may undergo frequent relapses of a purely catarrhal type; if this is what Whistler refers to, I quite agree with him. If, however, he refers to syphilitic relapses characterized by frequent deposits of gummatous material, I cannot agree with him. Under the influence of the syphilitic virus in the blood, a localized deposit of gummatous material occurs, which

[1] Op. cit., p. 53.

subsequently breaks down into ulcerative action. With this gummatous deposit the activity of the syphilitic virus for the time ceases, and the subsequent changes which occur, namely, the breaking down of the deposit in the establishment of an ulcerative process, are due to local causes. In this view a syphilitic ulcer becomes practically a local process, although having its origin in the specific blood poison. The extension or recurrence of ulcerative action is therefore to be regarded as due to a new deposit of gummatous material, or explosion, as it were, and this does not ordinarily occur in the superficial ulcer. This view is based on a somewhat large personal experience in the observation of diseases of the upper air tract, and I think that the course and development of syphilitic processes in this region differ notably from that of cutaneous syphilis; and while this behavior of a gummatous infiltration and the subsequent ulcerative process may not be true where it develops in the integument, I believe it to be the rule in the upper air passages. This feature of syphilis I regard as an important one, but it has already been fully discussed in a previous chapter.[1]

FIG. 66.—Superficial Ulceration in Left Glosso-Epiglottic Fossa.

A superficial ulcer is a somewhat rare form of laryngeal syphilis, and it is mainly important from a diagnostic point of view, and as indicative of the activity of the specific virus in the system. Its prominent features under ocular inspection are the same as those of the nose and pharynx, already described. It is usually of a rounded or ovoid form, of a bright yellow color, and surrounded by no areola or one very limited in extent. It is very slightly excavated, and secretes a somewhat healthy-looking yellow pus, which is tinged with blood and contains perhaps a few shreds of necrotic connective tissue. If the ulcer locates itself upon the ventricular bands, the epiglottis, or in the glosso-epiglottic fossa (see Fig. 66), or upon the posterior wall of the larynx, its characteristics are well marked, and ordinarily should be easily recognized. On the vocal cords, however, owing to the tenuity of the membrane, the ulcer is necessarily small in extent and attended by but a limited amount of secretion. Here, therefore, its recognition can only be

[1] Vol. i., pp. 345, 346.

based on a most careful inspection of the part with a thoroughly good illumination. This, however, will reveal the solution of continuity and loss of tissue which constitutes ulcerative action. This being the most frequent site of this form of ulcer, a definite diagnosis is not always an easy matter.

The possibility of syphilis developing in connection with a tuberculous process should always be borne in mind, two instances of this kind having been reported by Israi.[1]

The Gummy Tumor.

While the larynx may be invaded by any form of syphilis, from the primary lesion to the deep ulcer of the later stages, as a matter of clinical observation those lesions which we regard as belonging to the secondary stages attack the larynx with exceeding great rareness; in other words, in the very large majority of instances in constitutional syphilis the larynx remains intact until from five to ten years, or even longer, after the primary sore, when it becomes the seat of a gummatous deposit involving the deeper tissues of the mucous membrane and periosteum, giving rise to the gummy tumor and deep ulceration.

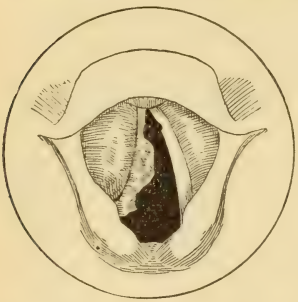

Fig. 67.—Gummy Tumor of Left Vocal Cord.

Owing probably to the fact that the larynx is the seat of a constant functional activity, a gummatous infiltration, in the majority of instances, breaks down so rapidly that when the lesion is first observed the ulcerative process is fully established. Occasionally, however, from some obscure reason, either in the character or distribution of the gummatous material, the breaking down of the tissue is delayed, and the lesion presents itself either in the form of a single or multiple tumefaction or of a diffuse infiltration. In a case reported by Moure,[2] a single tumor of large size and irregular shape occupied the left side of the larynx, giving rise to a certain amount of localized pain and dyspnœa; a sudden œdema supervening of the left ary-epiglottic fold, tracheotomy became necessary. The growth disappeared under specific treatment. A case reported by Luca[3] is interesting in that a gummy tumor attached to the posterior wall of the larynx existed for twenty-six months without notable change. It disappeared promptly, however, under medica-

[1] Wien. med. Presse, 1884, vol. xxv., pp. 1342, 1373.

[2] Revue mens. de Laryngol., 1884, vol. v., p. 297.

[3] "Osservazione clinica d'una Forme poco commune di Gomma laringea," Catania, 1888.

tion. In a similar case observed by Delie[1] the growth had lasted but two months. Other instances of single tumors have been reported by Charazac,[2] Fischer,[3] Cardone,[4] Schech,[5] and Massei;[6] while instances of multiple tumors have been observed by Semon,[7] Mandl,[8] and Fischer.[9] Cardone reports three cases, in one of which there was diffuse gummatous infiltration. Tracheotomy was necessary in all of them. In several of the cases reported there was more or less extensive ulceration, apparently of neighboring gummata.

SYMPTOMATOLOGY.—A gummy tumor consists of an infiltration of the deep layers of the mucosa, which may extend also to the perichondrium, in which case the subjective symptom of pain becomes a rather prominent feature of the attack. When the soft parts are involved, such as the ary-epiglottic folds or ventricular bands, the localized pain is not liable to be so prominent, although the pressure to which the parts are subjected during the act of deglutition may give rise to a certain amount of uneasiness. This also occurs when the posterior walls of the larynx are invaded. The voice is impaired according as the movements or contour of the vocal cords is affected. If the tumor encroaches on the respiratory tract, dyspnœa necessarily ensues, or this symptom may arise in consequence of an œdema set up by the presence of the growth, as in Moure's case.

DIAGNOSIS.—When a gummy tumor develops in the larynx, whether single or multiple, it presents in the form of a smooth, symmetrical, rounded tumefaction, which is ordinarily covered with healthy mucous membrane. It appears somewhat suddenly, and when it has attained its full development remains stationary, unless softening and ulceration occur. If the membrane covering the tumor is inflamed, this is usually, probably, to be attributed to other and ordinary causes. The growth may vary from the size of a pin head to that of a large cherry, and may occur in any portion of the larynx. The rapidity of the development, together with the subjective symptoms and the clinical history of the case, in connection with the smooth, rounded outline of the tumor, should always give rise to a suspicion of syphilis; and whereas ocular inspection may not always enable us to establish a definite diagnosis,

[1] Internat. Centralblatt für Laryngol., Rhinol., etc., Berlin, 1886, p. 237.
[2] Revue mens. de Laryngol., 1885, vol. v., p. 166.
[3] Wien. med. Woch., 1887, Nos. 17 and 18.
[4] Eco delle Cliniche, Jan., 1887.
[5] Deut. Arch. für klin. Med., 1877, vol. xx., p. 128.
[6] Giorn. internaz. di Sci. med., Naples, 1879, No. 1, p. 833.
[7] The Lancet, London, 1882, vol. i., pp. 520, 564, 599.
[8] "Mal. du Larynx," 1872, p. 700. [9] Loc. cit.

the effect of the administration of the iodide of potassium will in the course of a comparatively few days determine whether we have a gummy tumor to deal with. This final test, after all, is one which even the most expert laryngologist will often be compelled to resort to, in the case of a laryngeal growth, before he is enabled to give a decided opinion. Moreover, even in a case which has every appearance of malignant disease, I think it doubtful if we have done our full duty to the patient until he has had the benefit of anti-syphilitic treatment, for the purpose of thoroughly eliminating any possibility of a growth being of a specific character, even where the clinical history of primary or secondary syphilis is absent.

Course and Prognosis.—As we have already noticed, the tendency of a gummy tumor is to break down into ulcerative action. It would seem, however, that this tendency in certain cases is absent, and that, furthermore, if the ulceration does not occur comparatively early it may be delayed for months, and even years: thus in Luca's case, at the end of twenty-six months no tendency to ulceration seems to have developed.

The Deep Ulcer.

This lesion of syphilis belongs to what is designated, from a clinical point of view, as the tertiary stage of the disease, and rarely occurs under five years after the primary sore, and in a majority of cases probably after ten years have elapsed.

It results from the breaking down of a gummatous deposit which has invaded the deep layers of the mucosa proper.

As before noted, in certain rare instances a deep-seated gummy deposit may remain, without undergoing softening, for a varying length of time. In one case reported, a gumma in the larynx had failed to ulcerate at the end of two years. In the very large majority of instances, however, the ulcerative action follows so rapidly upon the deposit that when the case first comes under observation it presents as a fully developed ulcer.

It is a somewhat curious fact, in regard to all forms of syphilitic disease in the larynx, that the invasion is somewhat insidious, and that the lesion not only develops but may exist for a considerable period of time without giving rise to subjective symptoms proportionate to the gravity of the local morbid process. A certain amount of local pain, with perhaps tenderness on pressure, may attend the primary deposit, although even this may be absent. Impairment of voice or complete aphonia is present, according to the location and extent of the disease. The occurrence of ulceration,

however, is attended with a notable amount of secretion of mucopus. This contains an admixture of shreds of black, necrotic tissue, and is usually in the early stages streaked with blood. Hemorrhage to any appreciable amount is an exceedingly rare event, although Türck[1] reports an instance in which hemorrhage from a deep ulcer of the vocal cord terminated fatally.

The gummy tumor may so far encroach upon the air passages as to cause dyspnœa. After the ulcerative stage, however, interference with respiration does not usually occur, except in those rare instances in which œdema supervenes, and even when this develops it rarely attains such proportions as to seriously encroach upon the respiratory passages, although Balassa[2] reports a case of tertiary ulcer of the epiglottis, in a child suffering from congenital syphilis, in which the œdema became so extensive as to demand tracheotomy.

This form of ulcer occurs, in the order of frequency, upon the epiglottis, the vocal cords, the ventricular bands, and the arytenoid commissure. Where it attacks the soft parts, it is usually unattended with any complications other than a limited amount of œdematous or vascular tumefaction. Where it occurs in the neighborhood of the cartilages, as near the arytenoids or the cricoids, the primary infiltration is liable to extend to the perichondrium, giving rise to an attack of perichondritis. If this be sufficiently extensive, necrosis necessarily follows. Destruction of one or the other of the arytenoid cartilages in this manner is by no means an infrequent complication. A case of this sort reported by Labbé[3] is interesting, in that the necrosed arytenoid, becoming detached, made its way into the glottis and caused death from suffocation. The evidence of this complication lies in a certain amount of pain in deglutition, with swelling of the membrane covering the cartilage, together with impaired mobility of the cords and perhaps dyspnœa, according to the extent of the encroachment upon the breathing space.

If the perichondrium of the cricoid becomes infiltrated and a perichondritis is set up, there is localized pain, with tenderness on pressure, increased impairment of voice, but, most prominent of all, of course, is the dyspnœa, which develops rapidly and in a majority of instances very soon renders tracheotomy necessary. In a case of this kind reported by Pick[4] suffocation occurred before operative relief could be given. After the trachea has been opened,

[1] "Klinik der Krankheiten des Kehlkopfes," Wien, 1866, p. 413.
[2] Wien. med. Woch., 1862, p. 257.
[3] Bull. de la Soc. anat. de Paris, 1857, vol. xxxii., p. 210.
[4] Brit. Med. Jour., 1864, vol. ii., p. 645.

the further progress of this feature of the disease is practically the same as in the idiopathic form of perichondritis of the cricoid. The cartilage becomes necrosed, and a sequestrum forms which lies embedded in the tissues of the neck for months or even years, giving rise to a purulent discharge, either into the larynx or through external sinuses on the neck, as in the case reported by Bremond.[1]

Perichondritis and necrosis of the thyroid cartilage occasionally occurs, but usually only in the late stages of laryngeal syphilis. Such symptoms, however, as it may give rise to are generally masked by the more prominent and graver lesions in other portions of the larynx.

FIG. 68.—Destruction of Epiglottis from Syphilitic Ulceration.

The epiglottis is an exceedingly frequent seat of the tertiary ulcer, but here we have to do with a fibro-cartilage, and hence, instead of necrosis and the formation of a sequestrum we have simply a process of caries, by which the organ is destroyed by a more or less slow process of erosion (see Fig. 68).

We speak of perichondritis as a complication of the tertiary ulcer, but it is not to be understood that it is a complication which is liable to occur with the first development of this form of ulcerative action in the larynx. This is somewhat rare. The clinical history of tertiary syphilis in the larynx is often one extending over a number of years. Whistler,[2] as we have seen, designates the superficial ulcer as a "relapsing ulcerative laryngitis." Relapses are by no means so characteristic of secondary syphilis in the larynx as of the tertiary form. As already stated, after the gummatous infiltration occurs, the disease becomes to an extent local; in other words, the blood poison is for the time being latent, the ulcer cicatrizes, a certain amount of contraction ensues, with impairment of function, and a period of several months of immunity may elapse. Then another outbreak occurs, new gummatous material is deposited, which undergoes ulcerative action, and still further permanent mischief results. And so through five, ten, or fifteen years it may be, if the case is neglected or the blood poison is not eradicated, the progress of the affection is characterized by these recurrent attacks, or "relapses" as they may be called. Dur-

[1] Annal. des Mal. d'Oreille, 1878, vol. iv., p. 261. [2] Op. cit.

ing the early years of a laryngeal invasion these relapses are characterized, as a rule, by simple attacks of ulceration. During the later years, when the organ has been permanently impaired, its lumen notably encroached upon by cicatricial contraction, its blood-vessels hampered and its nutrition interfered with, deeper structures are invaded and we have the ulcerative processes complicated by perichondritis and necrosis.

It is in this later stage of tertiary syphilis more than the earlier years that we meet with localized œdema, and yet in my experience œdema plays a comparatively unimportant part in laryngeal syphilis, and instances are exceedingly rare in which this complication has given rise to grave symptoms. In the reports of the Vienna General Hospital[1] I find recorded two instances of subglottic œdema in this disease which required tracheotomy. A careful reading of these cases warrants the suggestion that the dyspnœa was due rather to perichondritis, in that in one case permanent wearing of the tube became necessary, and in the other death ensued a few days after the operation. The same can be said in regard to a case reported by Krishaber;[2] although in another case reported by the same observer, as also in two observed by Pick, there was sufficient œdema of the ventricular bands to give rise to notable dyspnœa.

The pathology of the gummy tumor, with the manner in which ulceration arises from an *endarteritis obliterans*, has already been sufficiently discussed in a former chapter.[3]

DIAGNOSIS.—The recognition of the deep ulcer, with its sharp-cut edges, dark red areola, excavated surface, and the profuse purulent secretion admixed with necrotic tissue, should ordinarily present no great difficulties. In tubercular disease we have no areola, marked pallor of the mucous membrane, a whitish-gray ulcerated surface, flush with the surrounding membrane, no depression, and a scanty secretion of ropy mucus.

In lupus we have the irregular contour, highly injected membrane, but no ulceration, no secretion of pus, and no exfoliation of necrotic tissue.

In sarcoma we have a distinct tumor, with perhaps an eroded surface, but no distinct ulcerated surface with pus secretion.

In carcinoma we have a hard, nodular tumor, with a ragged ulceration, the edges of which are not sharply cut; the ulcerated surface does not present the crater-like aspect of syphilis; we have the tendency to hemorrhage; and no well-marked areola.

[1] Aerzt Ber. des k. k. allg. Krankenhaus. zu Wien (1868), 1869, p. 210. Ibid. (1870) 1871, p. 306.

[2] Annal. des Mal. de l'Oreille, 1878, vol. iv., p. 187.

[3] Vol. i., p. 343.

Furthermore, in the ulcerative stage of carcinoma we ordinarily find the large, swollen cervical lymphatics, together with, in most instances, the peculiar cancerous cachexia.

PROGNOSIS.—The prognosis in the early stages of laryngeal syphilis is fairly good as regards an arrest of the disease, and yet I think tertiary laryngeal syphilis is to be regarded as evidence of a somewhat virulent blood poison; and if the laryngoscope reveals the existence of the deep ulcer, I think it is well to be somewhat guarded in giving an opinion as to ultimate success of treatment, especially as regards the complete restoration of function. There is always considerable destruction of tissue, and the healing process is attended with vigorous cicatrization, which will necessarily result in a certain amount of deformity of the organ.

CICATRICIAL STENOSIS.

The stenosis of the larynx which occurs in the late stage of syphilis is the result, I believe, in all cases, of a previously existing ulcerative process. A gummatous deposit, in the very large majority of instances, as we have seen, results in a localized necrosis involving more or less completely all of the tissues which have been the seat of the primary infiltration. After the diseased tissue has sloughed away, nature endeavors to restore the parts by the ordinary processes of repair.

As a matter of clinical observation, no ulcerative action is followed by more vigorous or extensive cicatrization than that of syphilis. When the cicatrized tissue becomes organized, it undergoes vigorous contraction; the result of this is that the normal contour of the larynx is to an extent destroyed, its lumen distorted, the breathing space notably encroached upon, and the vocal function seriously impaired.

A reading of a number of cases of syphilitic stenosis of the larynx would seem to indicate that the reporters entertained the view that the lesion occurred as the sequence of a deep-seated infiltration setting up a sort of submucous laryngitis, which in its late stages developed the laryngeal stenosis without ulceration. I have never seen any case of this disease in which the gross appearance of the parts did not warrant me in regarding the stenosis as due to a contracting cicatrix following a tertiary ulcer. I am therefore disposed to think that the existence of laryngeal stenosis not due to the presence of a gummy tumor or œdema, should always be regarded as evidence of a previously existing ulcerative process.

The manner in which the stenosis develops and the lumen of the larynx becomes narrowed by repeated outbreaks of syphilis has already been outlined in the previous section.

The symptoms to which the condition gives rise are impairment of voice and interference with respiration. Cough, with increased secretion, if present, should be regarded as an evidence of disturbance of the air passages lower down. Localized pain or tenderness on pressure may occur with the fresh syphilitic outbreaks, and are to be regarded as more directly symptomatic of a new gummatous deposit. Difficult or painful deglutition may be either due to coincident infiltration of the pharynx or parts above, or they may arise from a fresh gummatous deposit in the posterior wall of the larynx. The voice may be either simply impaired or completely lost, the patient being compelled to articulate in a whisper; yet in either case we have that coarse, harsh, raucous tone which to an experienced ear is characteristic of late laryngeal syphilis. Dyspnœa usually attends both inspiration and expiration, although it is usually more marked in the former, owing to the fact that during this act the softer tissues above the vocal cords are apt to roll in, in a valve-like way, as it were, upon the glottis, thus increasing the stenosis. The dyspnœa is increased on exertion, as is the case in all forms of laryngeal stenosis. In the earlier stages of the disease this symptom is not very prominent, but the narrowing of the larynx increases slowly but surely, as the result of the persistent contraction of the connective tissue which forms the cicatrix.

The clinical history of the case is liable to be marked by fresh outbreaks of gummatous infiltration followed by ulceration, under the influence of which the stenosis is still more markedly and permanently increased, although undoubtedly in many instances a notable laryngeal stricture may develop after a single attack. In addition to this, the mucous membrane becomes the seat of a catarrhal inflammation, under the influence of which the patient is exceedingly liable to take cold, which develops in the form of either a simple catarrhal laryngitis, or a submucous laryngitis with œdema, by which the symptoms are markedly aggravated. During the late stages of the disease, when the stenosis has attained considerable extent, these catarrhal attacks not only recur more frequently, but are liable to develop exceedingly grave symptoms, and suffocation may ensue unless relief is afforded by tracheotomy.

DIAGNOSIS.—In many instances the stenosis occurs in connection with the typical tertiary ulcer, the existence of which should render the diagnosis a comparatively simple matter under laryngoscopic examination. Where we have to do with a pure cicatricial contraction without ulceration, the ravages of the disease present certain characteristics which to an experienced eye are unmistakable. I know of no destructive ulcer in the larynx which gives rise to such peculiar distortion of the organ as the cicatrices

which follow the deep ulcer of syphilis. In tuberculosis we have an ulcerative process which manifests but the feeblest efforts at repair and shows little evidence of cicatrization. In syphilis, on the other hand, the reparative effort of nature is marked by the development of large bands of dense fascia-like cicatrices, which have drawn and distorted the organ in such a way as to completely destroy its symmetry. In tuberculosis the mucous membrane is pallid and exsanguinated; in syphilis, that portion which is not involved in cicatrization is highly congested and of a sombre, purplish hue. In cancer, before the ulceration occurs, we have the distinct and well-defined tumor encroaching upon the organ, but not necessarily drawing or distorting it. Furthermore, there are no cicatricial bands. When the ulceration of carcinoma occurs, it presents notable differences from the specific variety, as already indicated.

Practically the only disease with which syphilis of the larynx should be confounded is lupus. On ocular inspection, the appearances are very similar, both as to the asymmetrical distortion of the organ, and the peculiar venous hyperæmia of the mucous membrane. Our main reliance in making a differential diagnosis will lie in the fact that lupus does not take on true ulcerative action, as we usually understand ulceration, and, furthermore, if there is any attempt at cicatrization, it is certainly exceedingly feeble, and is never marked by the large bundles of cicatricial tissue which are seen in the cicatrices of syphilitic disease.

In addition to this, we will be notably aided by the clinical history of the case, the absence of the history of primary and secondary lesions, and the recurrent outbreaks which characterize syphilitic disease.

It is by no means an easy matter, and perhaps not an important one, to definitely locate the point of the stricture, in that the whole cavity of the larynx is so completely distorted by the disease. The ventricular bands are thickened, and usually adherent to the vocal cords, while the opening into the ventricles is obliterated. Both the true and false cords are more or less adherent, especially anteriorly, while the epiglottis is drawn down upon the larynx in such a way as to largely prevent careful inspection of the parts below. If the epiglottis has been involved in the ulcerative action, it is liable to be more or less completely destroyed, when the entrance of the larynx above presents a more or less rounded and ragged-looking circle, below which we see, in a progressively narrowing space, the ventricular bands merged into the true cords, and covered here and there with cicatricial bands, separated by areas of puffy, purplish-colored mucous membrane. Adhesions between either the true or

false cords generally occur anteriorly, thus leaving a narrowed breathing space in front of the posterior commissure (see Fig. 69).

While the above description may apply to cases in the late stage, in which both sides of the larynx are involved, it should be stated that practically no two cases are alike, and that we may have a considerable degree of stenosis as the result of ulceration and cicatrization, and largely confined to one side of the larynx.

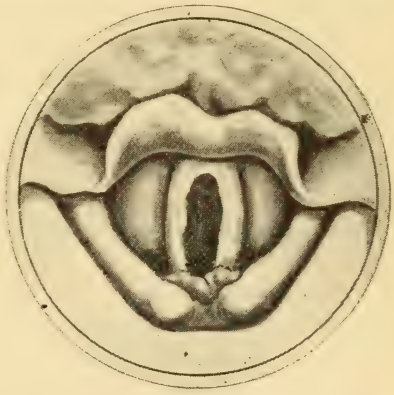

FIG. 69.—Cicatricial Stenosis of Larynx, the result of Syphilitic Ulceration.

Even in the comparatively early stage of the disease the crico-arytenoid articulation is largely involved on one or both sides, resulting in a fixation at or near the median line, thus giving rise to a condition which materially increases the stenosis. The occurrence of this fixation in the median line, as is the rule, is probably due to the fact that the abductor muscles are weaker than the adductors. The point is an interesting one, and is more fully discussed in the chapter on neuroses.

COURSE AND PROGNOSIS.—The clinical history of laryngeal syphilis, if we embrace its sequelæ, is essentially a protracted one, and may extend over a number of years. If the disease is recognized at its onset and subjected to proper treatment, it may be arrested; but if the original gummatous infiltration has been extensive and ulceration has ensued, a certain amount of destruction of tissue is the necessary result, and still further cicatrization and contraction must follow: no local or general treatment can control this. Our prognosis, then, at the earlier stage of the disease must be based on the extent of destruction that has occurred at the time the disease is recognized, and the probable amount of contraction which will result. This rule will apply both to the question of vocal impairment and as to the preservation of the normal breathing space.

The disease, of course, involves no dangers to life other than through the occurrence of dyspnœa and suffocation, an accident which can always be avoided, if its imminence is recognized early enough to perform tracheotomy.

TREATMENT OF LARYNGEAL SYPHILIS.

The Primary Ulcer.—All authorities unite in the view that the primary sore presents no indications for treatment, a better procedure being to await the development of secondary manifestations.

This rule applies as well to a laryngeal chancre as to the same lesion in other parts.

Erythema.—This lesion yields promptly to the administration of general remedies, after the manner already discussed.[1] If the local process assumes an aggravated form, the same topical applications are indicated as those recommended in the treatment of a simple acute catarrhal laryngitis.

The Mucous Patch.—The clinical history of the mucous patch in the larynx teaches us that it does not possess the same tendency to spread as when it occurs on the soft palate and pharynx, nor does it seem to be of the same persistent and recurrent type.

Apparently it yields promptly to internal medication. If, however, there should be any indication for local treatment, it is to be treated by cauterization in the same manner as a mucous patch elsewhere.

The Superficial Ulcer.—This lesion is to be treated by cleansing lotions and local applications of iodoform or europhen, after the manner already described.[2]

Whistler[3] finds a sixty-grain solution of nitrate of silver of especial efficacy. I have seen no case, however, in which, where local treatment was indicated, the lesion did not yield promptly to the application of iodoform. This should be applied by means of the Lefferts powder blower.[4]

The Deep Ulcer and Gummy Tumor.—These lesions are to be treated after the manner already described in a previous chapter.[5] Demarquay and Schnitzler[6] recommend inhalations of corrosive sublimate, from 1 part in 1,000 to 1 in 500, in all forms of syphilitic ulceration. This measure has been warmly indorsed by Massei[7] and Waldenburg.[8] The inhalation may be administered by means of the ordinary atomizer or by the Globe inhaler,[9] and is well worthy of trial in cases which do not respond promptly to the measures already recommended.

Cicatricial Stenosis.—As has been before shown, the stenosis of the larynx in syphilis is due not to an infiltration, but to cicatricial contraction and inflammatory adhesion of the tissue. No internal medication, therefore, is of any avail in either preventing the stenosis or in relieving it after it is developed. Furthermore, in this connection it should be stated that iodide of potassium, which is

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[1] Vol. i., p. 357. [2] Vol. i., p. 352. [3] Op. cit., p. 81.
[4] See vol. i., p. 29. [5] Vol. i., pp. 353 and 355.
[6] Cited by Gottstein: Op. cit., p. 274.
[7] "Patologia e Terapia della Laringe," Milan, 1877.
[8] "Die locale Behandlung der Krankheiten der Athmungsorgane," Berlin, 1872, pp. 244 and 371. [9] Vol. i., p. 45.

so frequently administered in the hope of affording relief, is not only without avail, but is attended with a certain amount of danger, in that the administration of this drug, even in moderate doses, is liable to give rise to an attack of iodism. As a rule, this manifests itself in the nasal passages in the form of an iodic coryza. It may also, however, develop an iodic laryngitis, whereby the dyspnœic symptoms are markedly and oftentimes dangerously aggravated. I am disposed to think that there is an especial danger in syphilitic laryngitis of this accident occurring, for, whereas I have never seen an acute laryngitis excited by the administration of iodide of potassium where the larynx was in a healthy condition, I have in several instances observed it in laryngeal syphilis. In ad-

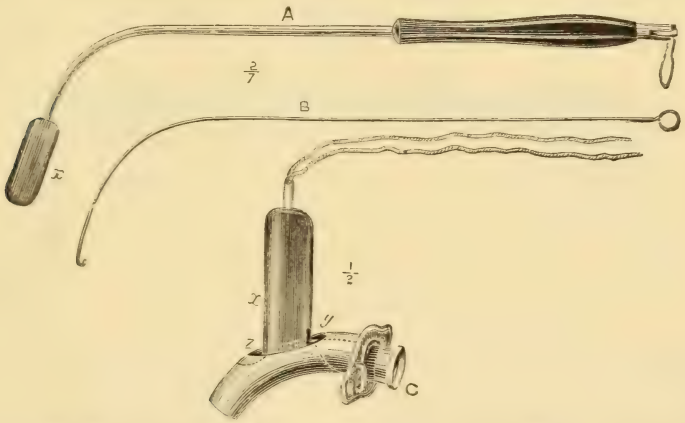

FIG. 70.—Schroetter's Laryngeal Dilator. *A*, The handle with bougie attached, ready for passing into the larynx; *B*, a slender rod for drawing the cord through the handle. The bougie *x* having been passed through the laryngeal stricture, enters the fenestra in the tracheal canula, and is held in place by the inner canula *C*, which passes through an opening in the lower end of the bougie.

ministering this drug, therefore, in those cases of stenosis in which the laryngoscopic appearances warrant a belief that gummatous infiltration exists, this danger should be borne in mind, and the effect of the drug watched with exceeding carefulness.

Having to do, then, with a condition which is not amenable to internal medication, I think we must consider this form of stenosis of the larynx as practically constituting a stricture of the air passages, and, furthermore, one which is to be treated in much the same manner as a stricture of any other tract, such as the urethra or the œsophagus. In these regions we recognize three methods of dealing with the disease, viz., continuous dilatation, divulsion, and section; and practically these are the same measures which are to be resorted to in dealing with this form of laryngeal stenosis.

The first to employ systematic dilatation in these cases was

Schroetter,[1] who devised a series of metallic bougies of a somewhat triangular shape, about one and one-half inches in length, and varying in diameter from one-quarter to two-thirds of an inch, there being twenty-four sizes. They were designed for use in cases in which a tracheotomy had already been done. The upper end of the bougie has an eye, into which is fastened a cord, while the lower end is expanded into a small knob. The patient having undergone such training, by the daily introduction of a probe into the larynx, as will enable him to tolerate the passage of the bougie, the plan of procedure is as follows: A cord is attached to the eye of the bougie, passed through a bent canula, and attached at the distal extremity of a handle into which the canula is inserted, as shown in Fig. 70. The bougie having been passed into the larynx, its lower end is inserted through the fenestrum of the tracheal tube,

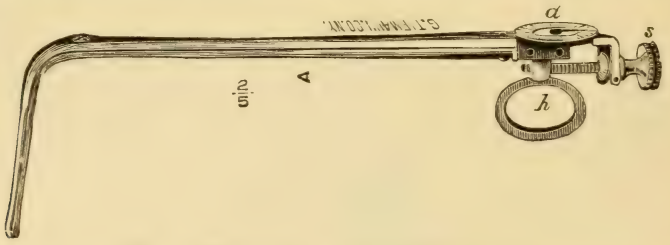

FIG. 71.—Mackenzie's Laryngeal Dilator, Closed.

where it is seized and held by a small pair of spring forceps inserted through the cervical end of the canula. The bent canula which is used for inserting the bougie is now withdrawn, leaving the cord protruding from the mouth; this is now secured by tying it round the neck, and the bougie left in place for a length of time varying with the tolerance of the patient. At the commencement of treatment, this will be perhaps not longer than a half-hour, but as the patient becomes tolerant it may be left in place a day or longer, and need only be removed for the purpose of cleansing, or for the insertion of a larger size.

When it is desirable to remove the bougie, the spring forceps are unclasped, after which it can be easily withdrawn by means of the cord.

Schroetter has modified this instrument somewhat, in doing away with the spring forceps by which the bougie is held *in situ*, and so arranging the lower end of the dilator that after it is inserted into the fenestrum of the tracheal canula it can be held in place by the inner canula of the tracheotomy tube. The dilatation of a laryngeal stricture by means of Schroetter's bougies is necessarily a somewhat

[1] "Beiträge zur Behandlung der Larynxstenosen," Wien, 1876.

slow process. In order to hasten the progress of the cure a number of instruments have been devised for the forcible dilatation of the stricture. As a rule, these are intended to be used mainly in connection with dilating bougies, as after the use of rapid dilatation the bougie is necessarily introduced in order to prevent the contraction of tissue which would ensue unless this were done. In Figs. 71 and 72 is shown Mackenzie's[1] dilator, which consists of three blades bent at the proper laryngeal angle, and is operated by means of a screw at the proximal end. The instrument is introduced closed into the larynx, after which the blades are opened by turning a screw. The amount of distention accomplished is shown by an index and dial plate on the handle.

Navratil's[2] dilator, shown in Fig. 73, is constructed on something of the same plan: it consists of a long metallic tube, bent to the

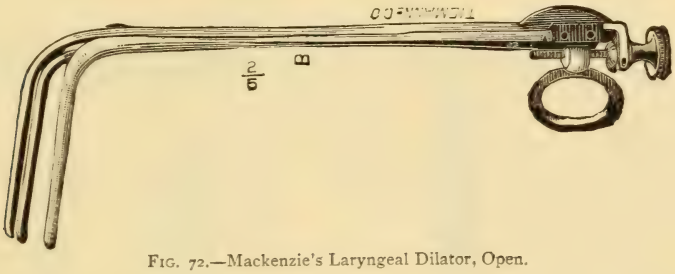

FIG. 72.—Mackenzie's Laryngeal Dilator, Open.

laryngeal curve, and containing within it a steel rod. On its distal end is mounted an olive-shaped bougie, composed of segments. These segments are attached by movable arms in part to the outer tube and in part to the central steel rod. The whole is mounted on a handle, by which the patient holds the instrument. At the proximal end of the instrument is a screw, by turning which the central steel rod is drawn within the outer tube, bringing forward the movable arms and expanding the segments. The extent of dilatation is indicated by a scale on the proximal end of the instrument.

A syphilitic stricture of the larynx is composed of dense, resisting bands of connective tissue, which do not yield easily to dilatation; and in many cases undoubtedly Mackenzie's instrument, and probably also Navratil's, might prove somewhat too delicate in construction. A three-bladed dilator, such as that described by Schroetter[3] constructed on much the same principle as that of Mackenzie, only much heavier and stouter in every detail, is a valua-

[1] "Diseases of the Throat and Nose," Amer. ed., 1880, vol. i., p. 265.

[2] "Laryngologische Beiträge," Leipzig, 1874.

[3] "Vorlesungen über die Krankheiten des Kehlkopfes," Wien, 1887, p. 255.

ble instrument in such cases. These instruments also are usually made use of after tracheotomy, although they do not involve the necessity of a tracheal opening.

Stoerck[1] has devised a three-bladed dilator, which is inserted, through the tracheal opening, for the divulsion of these strictures from below. I have in several instances attempted to operate in this way, but without success, and regard the manipulation through the mouth as much more feasible.

In those cases in which there is adhesion between either the true cords or the ventricular bands, or where a web has formed across the glottis, some form of cutting instrument answers a better purpose, as a rule, than dilatation. Elsberg[2] reports seven cases of web in the larynx, due to syphilis, which were operated

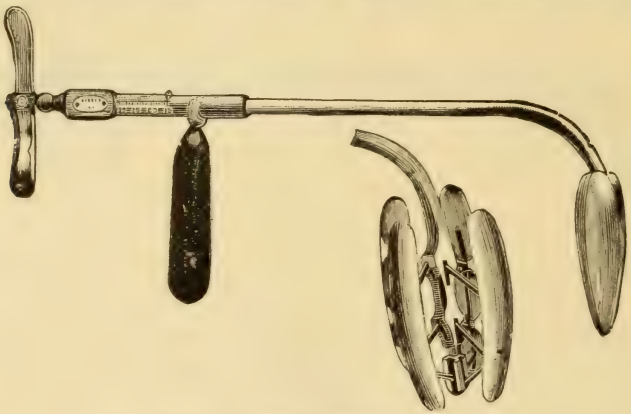

FIG. 73.—Navratil's Laryngeal Dilator.

upon either by the naked knife mounted on a properly curved shank, or by the galvano-cautery. In a case reported by Mackenzie,[3] access to the laryngeal cavity for the section of a web was obtained by thyrotomy, tracheotomy having been previously done.

Türck[4] reports three cases which were successfully operated upon through the natural passages by the knife. The same method was resorted to in cases reported by Navratil,[5] Rossbach,[6] and Massei.[7]

The use of a naked knife in the larynx requires rather nice manipulative skill. It is probably safer in these cases to make use

[1] Wien. med. Woch., 1879, No. 46.

[2] Arch. of Laryngol., 1880, vol. i., pp. 70 and 72. American Journal for Syphilis and Dermatology, 1874, vol. v., p. 1.

[3] Medical Times and Gazette, 1871, vol. ii., p. 218.

[4] "Klinik der Krankheit. des Kehlkopfes," Wien, 1856, pp. 408, 409, 410.

[5] "Laryngologische Beiträge," Leipzig, 1871, p. 60.

[6] Arch. für klin. Chir., vol. ix., p. 491.

[7] Virchow's Jahresbericht, 1872, pt. 2, p. 149.

of a concealed knife, such as Schroetter's or Mackenzie's instruments, in which the cutting blade is made to emerge from a tube after the instrument is inserted into the laryngeal cavity, as recommended by Schnitzler.[1]

Whistler[2] has devised an instrument which consists of a combination of a cutting instrument with a dilator, which possesses the advantage of putting the tissues on the stretch before they are incised, thus rendering the cutting more thorough. It consists of an olive-shaped bougie containing a concealed knife, which is only protruded when the instrument is *in situ*, as seen in Fig. 74. It is so arranged that the knife may be made to protrude either anteriorly or posteriorly. Browne[3] has devised a somewhat similar instrument, in which, however, the bougie is much smaller, and which possesses the special advantage of being mounted on a

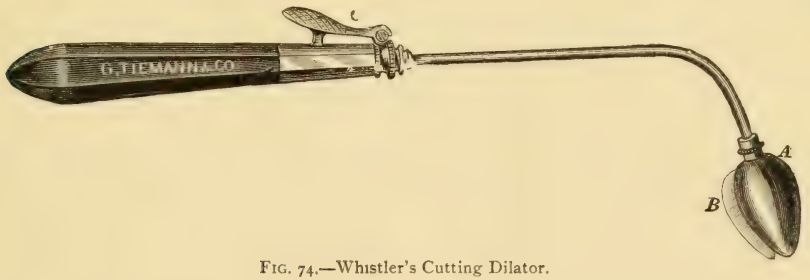

FIG. 74.—Whistler's Cutting Dilator.

hollow shaft through which respiration can be carried on, even while the instrument is in position.

The use of cutting instruments may not only be resorted to in the cases of a web in the larynx, or adhesion of the cords, but they are valuable in all forms of laryngeal stricture in facilitating the process of dilating. After incisions, however, the use of dilators is necessary to secure what has thus been gained, as otherwise the cut surface would adhere and no practical benefit be derived by the operation. In Mackenzie's case, after the stricture was cut, an attempt was made to keep the parts open by the insertion of a second tube passing through the tracheal canula and curving upward into the larynx. This was not tolerated and had to be abandoned. He then resorted to the use of Luer's valve, by means of which the expiratory current was deflected into the natural passages. In this manner a considerable degree of patency of the larynx was secured. The procedure is an easily available one in those cases in which a tracheal tube has been inserted, and is certainly one to be recommended.

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[1] Wien. med. Presse, 1867, vol. viii., p. 105.

[2] Arch. of Laryngology, 1880, vol. i., p. 322. [3] Op. cit., p. 391.

It would seem that the simple measure of passing a catheter through the larynx, which Catti [1] found so successful in overcoming the stenosis of a chronic subglottic laryngitis, might be of service in a syphilitic stenosis, in that the manipulation is a comparatively simple one, and can be accomplished without a previous tracheotomy.

In the early stages of the laryngeal stenosis this measure may well be resorted to; in the later stages, however, the cicatricial bands are of such a dense and firmly resisting character that they only yield before metallic dilators or bougies. A metallic catheter might possibly be used in this way, but the indications would certainly be much more directly carried out by intubation, as suggested by O'Dwyer,[2] who reports four cases in which this measure was successfully resorted to. Equally good results have been recorded by Lefferts [3] and others.

Intubation certainly possesses the great advantage, over every other method of treatment of a laryngeal stenosis, that it does not require tracheotomy, and that the treatment can be pursued while a sufficient patency of the air passages is maintained. O'Dwyer suggests that in those cases in which the stenosis is so great that a tube sufficiently large to admit of a proper amount of breathing space cannot be inserted, the patient be anæsthetized and the larynx forcibly dilated until a proper sized tube can be inserted. The greatest difficulty lies in the fact that the larynx is so far distorted by the diseased action that the ordinary tube is not easily inserted, and even after it is *in situ* is not easily retained. In those cases where this measure is available, I think there can be little question that intubation offers us probably the best method of dealing with a syphilitic stenosis of the larynx.

A number of cases have been reported as successfully treated by the various measures above enumerated, and yet it is probably exceedingly doubtful whether any case of advanced syphilitic disease of this character in the larynx has ever been so far cured that the tendency to recontraction disappeared and the larynx maintained its normal patency without further treatment.

Whatever measure is resorted to for overcoming the stricture, the contraction recurs, and these patients must be subjected to a periodical course of treatment to recover such ground as has been lost while remedial measures have been in abeyance.

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[1] Allg. Wien. med. Zeit., 1878, pp. 250, 258, 299, 326.

[2] N. Y. Med. Record, vol. xxix., p. 641. Trans. Internat. Med. Congress, 1887, vol. iv., p. 121.

[3] New York Med. Record, 1890, vol. xxxviii., p. 369.

CHAPTER XXXVIII.

TUBERCULOSIS OF THE LARYNX.

THE development and course of tubercular disease in the pharynx bears so close a relation to that of a similar process in the laryngeal tissues, and so many points in connection with the disease have been fully discussed in the former chapter, that, to avoid repetition, the reader is referred to what was said there for fuller information. We have there taken the ground that the development of a tubercular process acquires an added virulence, and occurs with greater rarity, according as it locates itself in the parts nearer to the outer world. This view was emphasized by the fact that tubercular disease of the pharynx is in the very large majority of, if not in all, cases, a manifestation of an acute miliary tuberculosis. As we approach nearer to the pulmonary tissues, the most favored site for tubercle development, and observe the process as it manifests itself in the larynx, we find it not only occurring more frequently than in the pharynx, but also assuming a less virulent character and taking on more of the features which characterize pulmonary phthisis, with the added symptoms which are dependent upon the locality and functions of the larynx.

The frequent occurrence of grave throat symptoms in connection with pulmonary phthisis must have suggested to the older writers the identity of the morbid process in the two regions, although it is not until the seventeenth century that we find any record of direct investigation of the parts. Thus, Sylvius[1] and Morton[2] describe the occurrence of nodules in the larynx which they designated as tubercular. Similar observations were made, a century later, by Stark[3] and Baillie.[4] About the same time, laryngeal disease seems to have been more closely identified with pulmonary

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[1] "Opera medica," etc., Avenione, 1680. "Praxeos medicæ," lib. i., cap. xxiv., § 4. p. 158.

[2] "Phthisiologie," 1689, German translation, Helmstedt, 1780.

[3] Cited by Reid: "The Nature and Cure of Pulmonary Phthisis," German translation by A. F. A. Diel, 2d ed., Offenbach a. M., 1787.

[4] "Anatomie des krankhaften Baues von einigen der wichtigsten Theile im menschlichen Körper," Berlin, 1794.

phthisis, by the investigations of Petit,[1] Portal,[2] and Sauvée,[3] who recognized the existence of ulcerative action in the larynx, and yet they failed apparently to make any distinction between the ulceration of syphilis and that due to tuberculosis. We are generally taught that Laennec,[4] in his famous treatise, was the first to insist on a specific form of laryngeal ulceration occurring in connection with pulmonary phthisis, and, furthermore, that it was due to a direct deposit of tubercles in the laryngeal mucous membrane. A careful investigation of Laennec's work, however, fails to establish this view, in that, whereas he records observations on tubercular disease of most of the other organs of the body, practically no reference is made to laryngeal tuberculosis. Five years later, however, we find Pravaz[5] teaching that the ulcerative processes which occur in the larynx in connection with pulmonary phthisis are the direct result of the softening and breaking down of tubercular nodules. To Pravaz, then, must undoubtedly be given the credit of having first taught the true nature of laryngeal phthisis, although it seems to have been vaguely suggested some years previously by Bayle.[6] In the year following the appearance of Pravaz's paper, Louis,[7] in his celebrated treatise, advanced the doctrine that the ulcerations of the larynx and trachea and parts above which occur in connection with pulmonary disease were due to the eroding influence of the sputa. This teaching was supported by a very careful and cogent train of reasoning. He demonstrated the fact that ulcerations only occurred in bronchi leading to large cavities, and, furthermore, that their frequency diminished as we approach the outer world. This view, however, failed to receive general acceptance. Following this we have the observations of Trousseau and Belloc,[8] who, recognizing a tubercular form of laryngitis, still write of a syphilitic variety of laryngeal phthisis. The subsequent investigations of Andral,[9] Albers,[10] Barth,[11] Hasse,[12] and others were in the main confirmatory of the teachings of Pravaz. From this time on, it seems to have been an accepted doctrine that the mor-

[1] "Dissert. Phthisi laryng.," Montpellier, 1790.

[2] "Traité de la Phthisie pulmonaire," 1792, p. 819.

[3] "Recherches sur la Phthisie laryngée," Paris, 1827.

[4] "Traité de l'Auscultation," etc., Paris, 1819.

[5] "Recherches pour servir à l'Histoire de la Phthisie laryngée :" Thèse de Paris, 1824.

[6] "Recherches sur la Phthisie pulmonaire," Paris, 1810, p. 58.

[7] "Recherches sur la Phthisie," Paris, 1825.

[8] "Traité de la Phthisie laryng.," Paris, 1827.

[9] "Clinique méd.," Paris, 1829, vol. ii.

[10] "Pathologie und Therapie der Kehlkopf-Krankheiten," Leipzig, 1829.

[11] Archiv gén., Paris, 1839, p. 137.

[12] "Anatomische Beschreibung der Krankheiten der Zirkulations- und Respirations-Organe," Leipzig, 1841, p. 480, etc.

bid process which gives rise to pulmonary phthisis may also localize itself in the laryngeal mucous membrane, and we find Rokitansky[1] and Virchow[2] asserting authoritatively that laryngeal phthisis is due to a tubercular deposit in the laryngeal mucous membrane, as a fact beyond question.

ETIOLOGY.—Tubercular disease manifests itself in the larynx, under much the same general influences as those which govern its development in the pulmonary tissues. Its most active cause, of course, is the tubercular diathesis, and by this we understand that peculiar systemic condition which in a large majority of instances, probably, if not all, is the result of heredity. Whether this condition consists in abnormally wide lymph channels, as suggested by Shakespeare, or some other systemic peculiarity, can only be a subject of speculation. The existence of this special diathesis we accept as a clinical fact.

In the very large majority of instances, a tubercular process in the larynx succeeds or accompanies a similar process in the lungs. It has long been a mooted question whether a tubercular process may occur primarily in the larynx. Alleged instances of this kind have been reported by E. Fraenkel,[3] Sinclair Coghill,[4] Trifiletti,[5] J. S. Cohen,[6] Browne and Grant,[7] Dehio,[8] Lavallée,[9] Lancereux,[10] Orth,[11] and others. It is claimed that the laryngeal disease can only occur in connection with the pulmonary, and that in those instances in which the disease apparently manifests itself first in the larynx the affection first exists in the lungs, and escapes detection by ordinary physical signs. The question is not an important one from a practical standpoint, and yet, as we have urged before, tubercle may occur primarily in any region of the body; it is difficult to understand, therefore, why the larynx should be exempt from a primary invasion. That the larynx may be invaded before any other portion of the air tract, has been clearly demonstrated in a case reported by Demme,[12] of a child aged four and a half years, dying of a tubercular meningitis, in which the autopsy revealed tubercular deposits in the larynx, while the pulmonary tissues were

[1] "Handb. d. pathol. Anatom.," Wien, 1842, vol. iii., p. 36.
[2] "Die krankhaften Geschwülste," Berlin, 1865, vol. ii., p. 645.
[3] Deutsche med. Woch. 1885, p. 490.
[4] Trans. Ninth Internat. Med. Congress, 1887, vol. iv., p. 26.
[5] Bollettino delli Malattie dell' Orecchio, etc., 1887, No. 5.
[6] Archives of Laryngology, 1881, vol. ii., p. 103. [7] Ibid., p. 6 *et seq.*
[8] St. Petersburg. med. Woch., 1888, No. 16.
[9] La France Médicale, 1884, vol. ii., p. 1650.
[10] Annal. des Mal. de l'Oreille, 1879, vol. vii., p. 338.
[11] Cited by Schroetter: "Vorlesungen über die Krankheiten des Kehlkopfes," Wien, 1887, p. 147.
[12] "Bericht über die Thätigkeit des Jenner'schen Kinderspitals," Berne, 1883.

normal. The laryngoscope had already revealed the existence of tubercular ulceration.

The actively exciting cause of the disease is to be found, therefore, either in the tubercular diathesis or, as occurs in a large majority of instances, a previously existing pulmonary phthisis. The theory of Louis, already alluded to, that the laryngeal ulceration results from the eroding action of the sputum as it makes its way over the laryngeal tissues from the diseased parts below, is at the present day indorsed by few observers. That auto-inoculation of the laryngeal membrane by the bacillus-laden sputa from the lungs may occur is altogether probable; that this should occur, however, it is necessary that the membrane should be the site of a catarrhal erosion. The most frequent site of an erosion, as we have seen, is at the posterior insertion of the cords, and on the anterior face of the arytenoid cartilages. Here, also, is the most common starting-point of a tubercular process in the larynx. The auto-inoculation of the tubercle, therefore, would seem to be a somewhat plausible explanation. In most instances, however, I think we must adopt the view that there is a common cause for both the laryngeal and pulmonary disorders, rather than that they stand in any direct causative relation to each other. A primary deposit of tubercle in the larynx can undoubtedly occur without involvement of the lung tissues. A recognized tubercular process in the larynx is not, therefore, to be regarded in every case as sufficient evidence of tubercular disease in the lungs. As a matter of clinical observation, however, in the very large majority of instances where the laryngeal disease develops, this occurs in the course of a chronic pulmonary disease. Furthermore, if, at the time the laryngeal affection is recognized, the lungs show no physical evidences of diseased action, the morbid process in the upper air tract is the strongest possible evidence that the pulmonary tissues are seriously threatened, and the development of diseased action there will very soon make itself known.

How far a chronic catarrhal process in the larynx predisposes to tubercular disease of this organ, is to a large extent a matter of speculation. I have always entertained the view that a catarrhal process is in every way distinct from tubercular action, and that they bear no definite relation to each other, either causative or other. The influence, therefore, of a chronic laryngitis, as a predisposing cause of tubercular disease, is probably greatly overestimated, although it is undoubtedly true that a phthisical patient, suffering with a chronic laryngitis, especially if this has resulted in erosions, is more liable to develop tubercular action than one in whom the laryngeal membrane is in a state of health.

The increasing number of reported cases which serve to establish the fact that tuberculosis is contagious suggests to us the wisdom of keeping in mind this clinical feature of the disease, in that the larynx, of course, is more exposed to floating germs in the atmosphere than the pulmonary structures; and furthermore, as has been previously urged, an inflamed membrane supplies a more favorable nidus for the development of a disease germ than one in perfect health.

The disease occurs more frequently in adult life, and between the ages of twenty and forty, and is also more common in males than in females. In 500 cases reported by Mackenzie,[1] 35 occurred before twenty, 194 between twenty and thirty, 162 between thirty and forty, and 109 between forty and sixty. Of these, 365 were males and 135 females. Heinze[2] found in the first decade of life 5 cases, in the second 23, in the third 130, in the fourth 112, in the fifth 67, in the sixth 27, in the seventh 9, and in the eighth 3. The proportion of males to females was much smaller, being 14 to 9. Demme[3] and Voltolini[4] have reported cases as occurring in childhood, while in Heinze's cases only 2.3% occurred under the ninth year.

Coming now to the frequency of the development of the laryngeal disease, Mackenzie,[5] in 100 cases of plumonary phthisis, found the larynx involved in 33 cases, or 33%. Louis'[6] statistics are much the same, he finding, in the examination of 193 subjects, ulceration of the larynx in 63, or 32.6%. In Heinze's 1,226 cases of phthisis examined at the Pathological Institute at Leipsic, laryngeal ulceration was found in 376 cases, or 30.6%, while in almost one-half the cases there was infiltration without ulceration. Willigk,[7] in 1,317 autopsies on phthisical subjects, found the larynx involved in but 237, or 13.8%. Schroetter's[8] statistics are still lower: in 723 autopsies of tuberculous patients, he found the larynx involved in but 44 cases, a trifle over 6%. Schaeffer,[9] on the other hand, in a laryngoscopic examination of 310 phthisical patients during life, found the larynx healthly in but 8 cases.

It would seem somewhat difficult to reconcile these statistics. In Mackenzie's 100 cases he reports a healthy larynx in but 29, while in 20 there was infiltration, and ulceration in but 13: in other

[1] "Diseases of the Throat and Nose," Amer. ed., Phila., 1880, vol. 1, p. 359.
[2] "Die Kehlkopfschwindsucht," etc., Leipzig, 1879. [3] Loc. cit.
[4] Deut. med. Woch., vol. x., p. 369. [5] Op. cit., p. 358.
[6] "Researches on Phthisis:" Sydenham Soc. Pub., 1844, p. 43.
[7] Prager Vierteljahresschrift, 1856, vol. xiii. pt. 2, p. 10.
[8] "Vorlesungen über die Krankheiten des Kehlkopfes," Wien, 1887, p. 147.
[9] Cited by Gottstein: "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 231.

words, in but 13% of the cases was there well-developed and active tubercular disease. Tubercular deposits in the mucous membrane are by no means uncommon; and whereas we cannot of course question the statistics of such careful investigators as Louis, and especially Heinze, who have shown over 30% of cases of laryngeal disease, we draw the conclusion that they have incorporated in their statistics all cases which showed any form of tubercular deposit in the larynx. We accept the fact, then, that in all cases of pulmonary tuberculosis the larynx is involved in nearly one-third. From a clinical point of view, however, I am disposed to think that Williglk's statistics are more nearly correct, and that we may anticipate that about 13% of cases of pulmonary tuberculosis will develop an active disease of the larynx, viz., that form of tuberculosis which manifests itself by well-marked subjective symptoms, and which is characterized by progressive waste of tissue.

PATHOLOGY.—Practically, a tubercular process in this region consists in the development of a peculiar form of inflammatory action in the mucous membrane, this peculiarity being primarily dependent upon and probably modified by the presence of the specific bacillus of tuberculosis. In the early stage, we find the membrane infiltrated with a large number of small, round, or embryonic cells, which diffuse themselves somewhat actively through the whole of the mucous membrane proper, and also show a tendency to aggregate in small, somewhat circumscribed masses. These circumscribed masses or collections of cells are supported by a delicate reticulum, and are more densely crowded toward the periphery, while the central portion of each collection shows a tendency to necrosis, as evidenced by the presence of granular matter. In many instances we find the centres of these collections occupied by rounded, protoplasmic masses, containing large numbers of nuclei, and which show on their periphery slender, thread-like processes, these constituting the giant cells.

The tubercular deposit primarily invades the mucosa proper, leaving the epithelial layer intact. The greatest activity of the process is usually developed about the walls of the blood-vessels, and also to a less extent in the neighborhood of the muciparous glands. In the former case they may go further and invade the walls of the blood-vessels, thus encroaching upon or even completely obliterating their calibre.

In probably the majority of instances, a tubercular process in the larynx is a progressive one, and tends to terminate, sooner or later, in ulceration; for while post-mortem examination shows a somewhat larger number of cases of simple infiltration of the larynx than of ulceration, it is to be borne in mind that in these cases

death supervened on account of the advanced state of the pulmonary disease, and before the laryngeal disease had developed into an ulcerative process. That a tubercular deposit in the larynx, however, may remain quiescent for a considerable period of time cannot be questioned.

The ulceration is due to a localized necrosis, in the centre of the circumscribed mass or nodule, as the result of a breaking down of the tissue, in consequence of the crowding together of the rapidly proliferating cells. The discharge of the nodule establishes a small point of ulceration on the surface of the membrane, which, by a slow process of extension, widens its borders, until it joins with its fellows, resulting eventually in the development of a broad and extensive ulcerated surface. The progressive character of the disease is still further shown by the invasion of the parts beneath the mucosa proper. Thus, where the perichondrium is involved, the affection is complicated by an attack of perichondritis, which eventually leads to necrosis of the cartilage. Invasion of the muscular structures, or of the fibrous tissue of the ary-epiglottic ligament, or of the vocal cords, may also occur as the result of an extension of the process in the mucous membrane.

The first manifestation of the disease in the larynx consists in a circumscribed deposit, usually in one side of the organ. The most frequent site for this primary invasion is in the membrane covering the arytenoid cartilage or commissure. Next to this, in order of frequency, are the mucous membrane covering the arytenoid cartilage, ary-epiglottic fold, the true cord, and lastly the epiglottis. After the primary invasion, the other portions of the larynx become involved, as a rule, by lateral extension or, in rare instances, by new centres of tubercular infiltration. After the ulceration has been established in one side of the larynx, it is probable that it may be transferred to the opposite side by a process of auto-inoculation, as seems to have been the case in a number of instances reported by Cadier.[1] Ariza[2] has reported two instances of long, pedunculated growths attached to the posterior wall of the larynx, which he regarded as tubercular in character, on account of a coexisting pulmonary tuberculosis, although their histological structure was not definitely ascertained. The small, wart-like excrescences which appear on the anterior face of the arytenoid commissure, and also occasionally in other portions of the larynx, in laryngeal phthisis, are conditions of common observation, and partake of the characters of ordinary papillary growths.

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[1] Annal. des Mal. de l'Oreille, 1883, vol. ix., p. 200.

[2] Revista de Med. y Cirugia Prácticas, December 22d, 1886.

I cannot agree with Stoerk [1] or Mandl [2] in regarding these wart-like excrescences as possessing any diagnostic value in the early stages of tuberculosis, as they are not infrequently observed in a simple catarrhal inflammation of the organ.

The œdema which is so frequently met with in connection with tubercular ulcers in the larynx is undoubtedly in some cases due to a tubercular invasion of the perichondrium, although undoubtedly, in the large majority of instances, it is an adventitious feature of the tubercular process, and is the result of the tubercular invasion of the walls of the veins, and the resultant obstruction to the return circulation, although it is to be borne in mind that in many instances the tubercular infiltration of the membrane itself leads to appearances which closely resemble an œdematous swelling, a condition which Gougenheim [3] describes as "false œdema."

SYMPTOMATOLOGY.—Impairment of voice is one of the earliest evidences of the tubercular invasion of the larynx, due in the majority of cases to an interference with the approximation of the cords rather than to any involvement of the cords themselves.

A chronic catarrhal laryngitis is by no means an infrequent complication of pulmonary tuberculosis; this, however, gives rise to an ordinary attack of hoarseness, the voice being harsh and coarse, with a lowered pitch. In tubercular disease, the impairment of voice manifests itself in its soft, weak, and somewhat aphonic character. This is especially true where the commissure of the arytenoids is so far infiltrated as to interfere with the approximation of the cords. From the same cause there is a certain amount of phonatory waste, the air escaping through the abnormally open glottis in the effort at talking, which thus becomes labored and wearisome to the patient. Not infrequently the voice is what Moure [4] calls "bitonal;" while the patient is talking in a low tone, the voice suddenly breaks into a falsetto note, which is maintained for a short time, and then the lower pitch is resumed.

Where the infiltration or ulceration invades the true cords, the vocal impairment is due to interference with cordal vibration. Here also the prominent characteristic of the voice is weakness, although a slight harshness of tone is given to it by the thickened cords. As the disease progresses, and the movements of the cords are interfered with by tubercular infiltration of the muscles or invasion of the crico-arytenoid articulations, the voice is completely lost, and the patient converses in a soft, weak whisper.

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[1] "Klinik der Krankheiten des Kehlkopfes," Stuttgart, 1880, p. 282.

[2] "Maladies du Larynx et du Pharynx," Paris, 1872, p. 688.

[3] Annal. des Mal. de l'Oreille, 1884, vol. x., p. 226.

[4] "Leçons sur les Maladies du Larynx," Paris, 1890, p. 155.

In rare instances we find the voice remaining practically unaffected up to a late stage of the disease. This, of course, only occurs where the tubercular infiltration expends itself in the upper portion of the larynx. Mackenzie[1] found the voice unaffected in 40 cases out of 500, or 8%.

Symptoms referable to deglutition occur quite early in the course of the disease. If the arytenoids are the seat of the infiltration, this symptom consists mainly in a slight difficulty in swallowing, attended perhaps with a certain amount of uneasiness in the region during the act. This is due in part to the impingement of the epiglottis on the crest of the arytenoids, and in part to the pressure of the bolus of food.

When ulceration occurs, the pain becomes more severe in character. This symptom increases with the extent of the swelling and ulceration of the parts, but becomes a source of acute suffering, however, only when the epiglottis is involved. When this occurs, not only the movements of the epiglottis in deglutition, but the pressure to which it is subjected in the act, are liable to become the source of such acute distress that the patient becomes averse to making the effort at taking even a limited amount of nourishment. This symptom is prominent when the epiglottis is only the seat of tubercular infiltration: when ulceration of this part occurs, the pain in deglutition becomes much more severe.

Cough is almost invariably present, and, while generally due to the pulmonary disease, its severity and persistency is undoubtedly aggravated by the laryngeal affection. Especially is this true of the ulcerative stage, when the secretions accumulate in the larynx and prove an additional source of irritation on account of the difficulty which the patient experiences in dislodging and expelling them.

Subjective pain is not usually characteristic of the stage of infiltration, although the larynx is somewhat sensitive to pressure, and the patient experiences considerable pain on movement of the organ. This symptom, however, is not so prominent in the early stage of the disease as it is after ulceration occurs.

The sense of fulness and distention in the parts is experienced very early in the history of the disease, and is due to the tumefaction of the tissues, which gives a sense of soreness and stiffness to the parts.

The secretion is a thick, inspissated, grayish, semi-transparent, ropy mucus, and is not very large in amount. If profuse purulent or muco-purulent expectoration is present, this is to be regarded as having its source in the pulmonary disease.

[1] Op. cit., p. 363.

Hæmoptysis occasionally occurs after the ulcerative stage has set in, although it is by no means a frequent symptom in the larynx. If this be its source, the blood shows itself in small masses, clots, or streaks in the sputa, in contradistinction from a pulmonary hæmoptysis, in which the blood is thoroughly mixed with the other masses expectorated. Free hemorrhage from the larynx is an exceedingly rare occurrence; I have never met with a single instance in which such an accident occurred.

If the infiltration extends to the perichondrium, a perichondritis is the result; this accident does not prominently complicate the disease, in that such a perichondritis presents none of the markedly painful symptoms which characterize an idiopathic attack of this affection. Necrosis of the cartilage necessarily follows such a complication. Instances of this as involving the arytenoids have been reported by Bertolet,[1] Dignat,[2] Browne and Grant,[3] and others. The necrosed cartilage may remain imbedded in the tissues, or it may separate itself and be expectorated. While the perichondritis is not especially painful, it may give rise to a notable amount of swelling and œdema of the mucous membrane covering it. Thus, in a case reported by Chalvet,[4] a perichondritis involving the arytenoids gave rise to such an extensive œdema that tracheotomy became necessary.

A moderate amount of œdema in laryngeal phthisis is by no means uncommon, yet instances are exceedingly rare in which it develops to such an extent as to constitute a grave complication. That death may result from this cause is attested, as far as I know, but by a single case.[5]

When laryngeal dyspnœa becomes a prominent symptom, as happens in rare instances, I am disposed to think that its source is not to be found in the œdematous swelling so much as in a narrowing of the glottis from anchylosis of the crico-arytenoid articulation; when this occurs, the fixation is very liable to occur with the cords in or near the median line, giving rise to a condition similar to that of bilateral paralysis of the abductor muscles.

The epiglottis being a fibro-cartilage, an extension of the tubercular infiltration to this part results in an ordinary ulcerative process, rather than necrosis. Gaucher[6] reports an instance in which the thyroid cartilage was invaded, resulting in ossification, separation of the alæ, and the establishment of a fistulous opening.

In a majority of cases, as we know, the laryngeal disease is su-

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[1] Trans. Path. Soc. Phila., vol. iv., p. 145.

[2] Revue mens. de Laryngol., 1883, vol. iii., pp. 239 and 260.

[3] Loc. cit., p. 2.

[4] Lyon méd., 1870, vol. v., p. 176.

[5] Aerztl. Ber. des k. k. allgemeinen Krankenhauses zu Wien, 1859–60, pp. 34 to 39.

[6] Progrès médical, 1876, vol. vii., 445.

perimposed on a previously existing pulmonary disorder; and even in those cases in which the tubercular cachexia is already present, the invasion of the larynx seems to add an additional element to the general systemic depression—more, proportionately, than is to be explained by the area of the tissue involved. This is due in part, perhaps, to the greater physical pain and suffering which a tubercular laryngitis involves, together with the interference with proper nutrition on account of the painful effort which so often accompanies the act of deglutition. There is a still further element of systemic depression, I think, in the dread of throat consumption which exists in the minds of most people; these patients are exceedingly anxious and apprehensive, and are fully conscious of the fact that, the disease having attacked the larynx, the prognosis is rendered an exceedingly grave one. The emaciation and loss of flesh which occurs in laryngeal phthisis is of course due more directly to the pulmonary lesion; and yet those who see many cases of laryngeal tuberculosis, I think, will recognize the fact that there is oftentimes to be observed in these cases an anxious, drawn, and pained expression of face, which is something more than the mere emaciation of pulmonary phthisis.

DIAGNOSIS.—Ordinarily, the subjective symptoms of laryngeal phthisis are so well marked, especially in those cases which supervene upon pulmonary disease, that a diagnosis can be made with a considerable degree of certainty. A laryngoscopic examination alone will reveal to us the extent of tissue involved, the definite character of the lesion, and the stage of the disease. The assertion has been made by Von Ziemssen[1] that a tubercular process in the larynx cannot be definitely recognized as such by ocular inspection in those cases in which the diagnosis is unaided by a previously existing pulmonary disease. This view has been indorsed by Poore[2] and Cohen.[3] On the contrary, I think that tubercular disease presents appearances so typical and characteristic that, certainly in the very large majority of cases, if not in all, we should be able to recognize it as such with comparatively little hesitancy; and while not fully indorsing Browne,[4] who states that "we know no disease in which, with the laryngoscope, we can be so sure of our diagnosis," I think that an error in diagnosis is rarely justifiable in one who has had opportunities of observing and following even a moderate number of cases.

The primary effect of a tubercular infiltration seems to be,

[1] "Cyclop. of the Practice of Medicine," Am. Edit., vol. vii., p. 848.

[2] Lancet, London, 1880, vol. ii., p. 83.

[3] "Diseases of the Throat and Nasal Passages," 2d ed., New York, 1879, p. 512.

[4] "The Throat and Nose and their Diseases," 3d ed., London, 1890, p. 414.

to cause, first, a certain amount of tumefaction of the part, and, secondly, an interference with circulation. The result of this is to give an appearance to the membrane which is quite characteristic, and usually not to be mistaken for any other condition.

When brought into view by means of the laryngoscopic mirror, the first appearance which is noticeable is the tumefaction. This is usually, in the early stages, confined to a circumscribed area of the mucous membrane of the larynx, and consists in a swelling, whereby the normal thickness of the membrane is increased, apparently two to three fold. In the large majority of instances, the part primarily invaded is the membrane covering the arytenoid cartilages and commissure, giving rise to the condition generally known as club-shaped arytenoids. According to Browne,[1] one

FIG. 75.—Tuberculosis of the Larynx, with Infiltration of the Epiglottis, producing the So-called "Turban-shaped" Epiglottis.

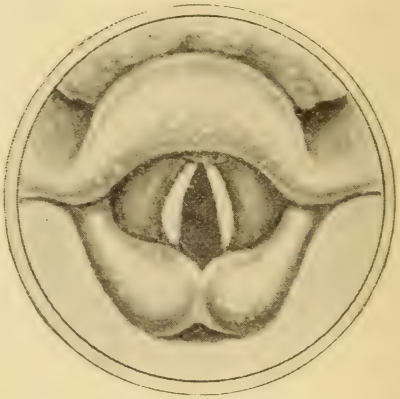

FIG. 76.—Tuberculosis of the Larynx. Numerous miliary tubercles are seen lying just beneath the epithelial layer of the mucous membrane.

side is much more involved than the other, although in my own experience these masses invariably presented an almost symmetrical outline. If the ventricular bands are involved, the condition is usually unilateral, and the asymmetry of the larynx becomes quite noticeable. If the epiglottis is involved, the infiltration very early invades the crescentic edge, giving rise to what has been described as the turban-shaped epiglottis (see Fig. 75). Here, again, the tumefaction is usually symmetrical, although in the commencement of the invasion of this portion of the larynx I have seen a well-marked unilateral tumefaction. While, then, the circumscribed tumefaction, and in certain cases the unilateral distortion of the organ, should excite suspicion, especially in patients suffering from pulmonary tuberculosis, the peculiar color which the disease presents in the first stage will go far toward eliminating any doubt as to the character of the lesion.

[1] Op. cit., p. 415.

At the onset of the disease, the membrane presents a dull gray color, with a slightly yellowish tinge. The surface is smooth and moist, and yet the characteristic sheen of a healthy mucous membrane is notably dulled. Furthermore, the peculiar semi-translucent appearance of a healthy membrane is lost, and it takes on a somewhat solid and semi-opaque aspect. At the end of a few days, or at the latest, perhaps, at the end of a week or two, a careful examination will reveal a new appearance, in that the membrane becomes dotted over or studded with minute yellowish points, which mark the development of tubercular nodules in the more superficial layers of the mucosa proper, and immediately beneath the epithelial layer. They give rise to no superficial elevation, but can be seen somewhat hazily, as it were, through the semi-transparent epithelium (see Fig. 76). They are of a grayish yellow tinge, and of a distinctly lighter color than the mucous membrane surrounding them. They are dotted thickly through the superficial mucosa, and appear to be separated from one another by perhaps a half a line or less.

The further development of the morbid process in the larynx consists in the breaking down of these small tubercular nodules, and the establishment thus of minute points of ulceration, the borders of which, by a slow process of extension, widen until they meet similar ulcerated points in neighboring parts, and thus eventually there is established an ulcerated surface covering a more or less wide area.

FIG. 77.—Extensive Tubercular Ulceration of the Larynx.

After the stage of ulceration has set in, the morbid process assumes quite a different aspect. I am disposed to think, however, that the appearance of the tubercular ulcer is even more typical and characteristic than the appearance of the membrane in a state of simple infiltration, and is thus one which should rarely be mistaken for any other lesion. The change which now occurs consists practically in the destruction, by exfoliation, of the epithelial surface, and the uncovering, as it were, of the tubercular process in the mucosa, which now gives rise to a certain amount of superficial waste. In color, the ulcer does not differ notably from the infiltrated membrane, presenting still a grayish-yellow appearance, although it is occasionally dotted here and there with minute ele-

vations of a somewhat pinkish color. The surface is ragged and worm-eaten, as it were (see Fig. 77). Fränkel likens it to the surface of cut bacon, while La Boulbene compares it to the track of earthworms in wet sand. To me, it has often suggested a dish of wet meal which birds have pecked at. The ulcerated tissue, as well as the infiltrated membrane surrounding it, is highly anæmic, and the color of the two portions is so closely alike that it is oftentimes not easy to detect where the unbroken mucous surface ends and the ulceration begins. The edge of the ulcer is irregular in outline, and its surface flush with the surrounding tissues. In other words, while there is superficial waste, there is an equal amount of progressive tubercular infiltration, which fully compensates for the superficial waste. The loss of tissue, therefore, is not apparent, in that the general contour of the parts is practically maintained. Occasionally, the central portions of an ulcer may be slightly depressed, perhaps, but this is not the rule.

The secretion from the surface of a tubercular ulcer is a thick, tenacious, semi-opaque, ropy mucus. It adheres closely upon the diseased surface, and is quite limited in amount. This we can easily understand when we remember that not only the epithelium, but the muciparous glands are practically destroyed early in the progress of the disease. That the morbid process is not attended with any extensive or rapid cell proliferation, or, in other words, that the ulcerative process is not a rapid one, is shown by the fact that the secretion is of a grayish and semi-translucent character, thus containing but a limited number of pus corpuscles.

We have stated that the result of the process is practically no very notable loss of tissue, as far as the general contour of the parts is concerned. An exception to this is found in those instances in which the fibro-cartilage of the epiglottis becomes the seat of a tubercular ulceration, as in these cases there is a somewhat slow but progressive destruction of this organ. The same is true, and to a less noticeable extent, with reference to the vocal cords. The arytenoid cartilages, in rare instances, become necrosed and exfoliated, not as the result of tubercular disease of the cartilage itself, but rather of the perichondrium. Even this, however, results in no very noticeable loss of tissue. The point which it is desired to emphasize in this connection is that the very extensive tubercular infiltration of the mucous membrane, or the parts beneath, results in a thickening, which more than compensates for any superficial loss of tissue which is due to the ulcerative process on the surface.

As before stated, tubercular disease presents appearances which should not easily be mistaken for any other form of diseased ac-

tion, and yet the discussion is scarcely complete without emphasizing the distinctive points of difference between this disease and syphilis, lupus, perichondritis and malignant affections.

In the superficial ulcer of syphilis, we have a distinctly yellow, purulent discharge, a slightly rounded excavation, surrounded by a reddened mucous membrane, without swelling, in contradistinction to a tubercular process in which the secretion is gray mucus, with no excavation, and a mucous membrane surrounding it, which is absolutely bloodless and notably swollen. In the deep ulcer of syphilis, we have all the features of the superficial ulcer exaggerated, with the markedly injected areola surrounding it, and the profuse discharge not only of pus, but necrotic tissue. The possibility of the two processes occurring simultaneously in the same larynx is to be borne in mind. When this occurs, however, each disease seems to maintain its characteristic features, as in the case reported by Arnold.[1] A similar instance is depicted by Browne.

In lupus, we have a highly injected condition of the mucous membrane, with nodular swellings, exceedingly limited secretion, together with a possible appearance of ulceration, which, however, it is almost impossible to definitely outline and distinguish.

Perichondritis may possibly be mistaken for a tubercular infiltration. In the latter process, however, the distinctly exsanguinated appearance presents a marked contrast to the highly injected and semi-œdematous aspect of inflammation of the perichondrium.

In malignant disease, we have the unilateral tumor, with its irregular nodular outline, together with the highly injected mucous membrane covering it, and, where ulceration occurs, the more or less profuse secretion of an ill-smelling muco-pus, often charged with blood and necrotic tissue. Laryngeal stenosis, moreover, is characteristic of malignant disease, and rarely of tuberculosis.

We have already asserted that the characteristic feature of vocal impairment in laryngeal phthisis is a weakness of the voice. The laryngoscopic examination will reveal, as the source of this weakness, either an ulceration involving the vocal bands themselves, or, what is a more efficient cause, an impairment in adduction, the result of an infiltration of the arytenoid commissure. This impairment of motion of the cords may also arise from an involvement of the crico-arytenoid articulation, giving rise to a defective mobility, or even a complete anchylosis. This condition may occur either in one or both sides of the larynx. It is a curious

[1] Pacific Med. and Surg. Jour. and Western Lancet, April, 1887.

[2] Op. cit., plate viii., fig. 76.

clinical fact, the cause of which will be discussed more at length in the chapter on Laryngeal Paralyses, that, where an anchylosis of this joint develops, the fixation is more liable to occur with the cord in the median line than in abduction. The examination of the larynx, therefore, will reveal an apparent paralysis of abduction, either one or both vocal cords lying in the median line, or possibly in the cadaveric position. The real lesion in these cases is to be regarded as an anchylosis of the crico-arytenoid articulation. This was probably the real source of the symptoms in the cases of bilateral paralysis of the abductors occurring in connection with tubercular laryngitis reported by Riegel[1] and Webber.[2] Cartaz[3] has reported two cases, in which the first manifestation of tuberculosis in the larynx was in the crico-arytenoid articulation, resulting in anchylosis, from which the conclusion is drawn that paralysis of one or both of the cords should be regarded as a suspicious symptom. A somewhat similar observation is made by Martel.[4] So general a deduction is perhaps not fully warranted, and yet a laryngeal paralysis in a tubercular patient is to be regarded as of grave import.

PROGNOSIS.—When tubercular laryngitis supervenes upon an attack of pulmonary disease, it is to be regarded as an exceedingly serious complication, and one which adds an additional gravity to an already unfavorable prognosis. When the disease develops primarily in the larynx, or simultaneously with a pulmonary invasion, it is to be regarded as evidence that the tubercular infection is characterized by unusual virulence and activity.

The average duration of life after the onset of pulmonary phthisis is generally stated at about three years. Loomis[5] found it in his own recorded cases, three years and four months. Mackenzie,[6] from 100 recorded cases of laryngeal phthisis, deduced the fact that in the greatest number of cases death occurred in from 12 to 18 months after the occurrence of troublesome throat symptoms, and that in 66% death occurred between six months and two years.

These figures, however, do not afford us any information as regards the average duration of life in those cases of tuberculosis in which the larynx is invaded, nor do I find this information in the ordinary statistics in regard to the prognosis in pulmonary disease.

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[1] Ziemssen's "Cyclop.," Amer. ed., vol. vii., p. 961.
[2] Philadelphia Med. Times, June 19th, 1880.
[3] La France méd., November, 1886.
[4] Revue Internat. des Soc. méd., May 31st, 1887.
[5] "Practical Medicine," New York, 1884, p. 197.
[6] Op. cit., p. 374.

In my own recorded cases, the longest period in which any patient survived after the onset of pulmonary disease which was subsequently complicated with the laryngeal invasion was 46 months, while the shortest period was 3 months; the average duration of life being 22⅔ months; and although these statistics are not based on a large number of cases, I think they indicate, with a fair degree of correctness, the average duration of life in laryngeal phthisis, estimating from the first manifestation of the tubercular disease, whether in the lungs or larynx. In other words, if the average duration of life in pulmonary phthisis is three years, the occurrence of laryngeal complications adds so far to the gravity of the affection that the probable duration of life is reduced one year.

To repeat these points, the average duration of life in pulmonary phthisis is three years; the average duration of life in pulmonary phthisis complicated by laryngeal disease is two years; the average duration of life after the supervention of laryngeal complications is eighteen months.

In individual cases, of course, the prognosis of laryngeal disease is markedly influenced by special circumstances, the most important of these being the progress of the pulmonary disease, if such exists. If the lungs are in an advanced state of phthisis, the laryngeal disease runs a more rapid course and leads to an earlier fatal issue. On the other hand, if the pulmonary disease is in its earlier stages, and does not advance rapidly, the laryngeal disorder may run an exceedingly chronic course. There are also certain features of the local manifestation in the larynx which influence the prognosis. If the epiglottis is involved, the subjective symptoms, as before stated, become of an exceedingly painful character, while at the same time the progress of the disease seems to be accelerated, and ulceration sets in quite early, owing to the fact undoubtedly that the parts are subjected to constant irritation and pressure in the act of deglutition and in the ordinary functional movements of the organ. In a less degree the same is true where the mucous membrane covering the arytenoid cartilages and commissure is involved. If the ventricular bands, on the other hand, are attacked, we not infrequently find that the local lesion develops rather slowly. This is due probably to the fact that the parts are subjected to no special attrition or pressure in the ordinary functional movements of the larynx.

From a practical point of view, of course, the more important consideration has to do with the prognosis of this affection, as regards treatment. Unquestionably, in the very large majority of cases, all measures of treatment fail to arrest the disease, and a fatal termination ensues sooner or later. We are justified, I think,

in confining ourselves, in the discussion of prognosis, to the laryngeal manifestation, and may fairly claim a cure if the tubercular process in the larynx is arrested, although the patient subsequently dies of the pulmonary disease. In this view of the case, we may go further, and say that patients have rarely ever died of laryngeal phthisis, as the laryngeal disease is a complicating lesion, and the direct cause of death is in the pulmonary disease. If, however, our remedial efforts succeed in arresting the local lesion in the larynx, we are undoubtedly not only prolonging life, but relieving our patient from a grave complication of the pulmonary disease, which is the source of an amount of suffering and distress that is exceeded in but very few diseases which we encounter. In this view of the case, I am disposed to think that the prognosis is not so unfavorable as is claimed by most observers; and whereas undoubtedly a majority of cases resist all remedial efforts, in a certain proportion of instances, by a carefully carried out and judicious course of general and local measures of treatment, we may entertain a reasonable hope of arresting the morbid process. This is especially true if our therapeutic measures are undertaken in the first stage of the affection; and, furthermore, if our efforts fail to arrest the disease, we may not only retard its progress, but alleviate many of its most distressing and painful symptoms.

In no ulcerative process, probably, are we able to detect in a less degree any reparatory effort on the part of nature than in tubercular ulceration, and yet instances of spontaneos cicatrization have been reported by Bouveret,[1] Virchow,[2] Jarvis,[3] and others.

TREATMENT.—We have already, in the chapter on tuberculosis of the pharynx, discussed somewhat at length the mild plan of treatment, which in my own hands has been found most efficacious in the relief of tubercular disease. This consists, first, in the thorough cleansing of the parts; second, the use of a mild astringent; third, the topical application of morphine, either in powder or solution; and fourth, in the stage of ulceration, the insufflation of iodoform.

For the details of this method of treatment, the reader is referred to the former chapter. It is of the utmost importance that these applications should be carried out in such a manner as will in the least degree irritate the diseased part. For the larynx, the solution should be applied by means of the atomizer, and here the ordinary Sass spray tubes, worked with the compressed-air apparatus, are of special efficacy: the tongue being well protruded, and

[1] Lyon méd., 1882, vol. xxxix., p. 126.

[2] Berlin Medical Society: cited in New York Med. Record, vol. xxxiii., p. 279.

[3] Trans. Amer. Laryngol. Ass'n, 1883, p. 30.

the beak of the spray tube being passed into the fauces until it projects over the epiglottis, the sudden letting on of the pressure floods the cavity with a finely atomized fluid in such a way that the whole of the diseased surface is thoroughly bathed in the medicated solution before the parts can contract in such a manner as to shut off the cavity. In the absence of the compressed air, the hand-ball atomizer, deftly used, can be made to accomplish an excellent purpose.

The iodoform is best applied by means of Ely's powder blower,[1] with a properly curved laryngeal tip. By this instrument, the powder is distributed equably over the diseased surface in such a way as to cause the least irritation.

Occasionally in the ulcerative stage a more permanent effect of the morphine will be obtained by combining it with the iodoform and a mild astringent, as in the following formula:

℞ Morphinæ, ... gr. x.
Acidi tannici, ... ʒ ij.
Iodoformi, ... ʒ vi.
M.

It is to be borne in mind always, in using morphine, that its constitutional effect is promptly felt when applied to the mucous membrane of the air tract; hence, care should be exercised in using certainly no more than the officinal dose. This plan of treatment is to be carried out two or three times weekly, or even daily, according to the relief given and the observed effect on the morbid process.

In the stage of infiltration, I have rarely seen instances in which the subjective symptoms were not very notably relieved by this plan of treatment, and in most instances the local morbid process seemed to be notably retarded, as evidenced by the laryngoscopic appearances.

With the development of an ulcerative process, of course, we have to deal with a much graver lesion; and yet in this stage of the disease I have seen a number of cases in which, by the daily resort to the above plan of treatment, cicatrization resulted; and although these patients ultimately died of pulmonary phthisis, the success of local measures in arresting the laryngeal complication was clearly illustrated. It should be stated, however, that in these successful cases the ulcerative process was confined to the ventricular bands, the vocal cords, or the commissure; in no case have I seen more than temporary relief afforded in a case of laryngeal tuberculosis in which the epiglottis was involved. The iodoform,

[1] See vol. i., fig. 30

of course, is inert in the first stage, but in the ulcerative stage I am disposed to think that this drug is the important agent; thus, Lublinski[1] reports having treated 75 cases with iodoform insufflations, of which 73 were improved and 2 cured; while Semon[2] reports improvement in all his cases from the use of this drug. Massei,[3] recording his experience, states that he has found quite as good results from the use of iodoform as from lactic acid. In addition to this, he uses inhalations of corrosive sublimate, one part to a thousand. He also states that iodoform is much to be preferred to its inodorous substitute, iodol. I have recently been much pleased with the action of europhen as a substitute for iodoform. It is practically odorless, and apparently possesses the same action.

The local application of cocaine would naturally belong to the mild plan of treatment above detailed, and yet in my experience I have failed to discover that cocaine possesses any valuable curative properties either in the stage of infiltration or ulceration. It is of incalculable value, however, in those cases in which deglutition is painful, in that the temporary anæsthesia which is secured by its use enables the patient to take food and drink with ease and comfort, where otherwise this act would be attended with distressing pain. For this purpose I have been in the habit of suspending the cocaine in an oily menstruum, as follows,

℞ Cocainæ hydrochloratis, . . . gr. xx. to xxx.
Aquæ, ... ʒ ss.
Ft. sol. et adde
Ol. petrolati, ... ad ℥ i.
M.

this is to be inhaled by the patient, as needed, from the Burgess atomizer.[4]

Of the inhalation of medicated solutions, by means of the steam atomizer, or dry inhalations of the gum resins, etc., I have already expressed my disapprobation in the chapter on Tuberculosis of the Pharynx. In the same place the excellent results obtained by Heryng and Krause, from the use of lactic acid, with or without scarification, have been fully discussed, as also the menthol treatment of Rosenberg, and Schmidt's scarifications. In making applications of lactic acid to the larynx, the drug is carried down to the parts by means of a pledget of cotton on a probe, the manipulation

[1] Deutsche med. Woch., 1886, p. 915.
[2] St. Thomas' Hosp. Reports, n. s., vol. xii., p. 108.
[3] Revue mens. de Laryngol., 1886, Nos. 5, 6, 7, 8.
[4] See vol. i., fig. 47.

being of course directed by the laryngeal mirror *in situ*. In view of the excellent results which have followed the lactic acid treatment, I do not think we have done our full duty in any given case without fully testing its efficacy. In connection with it, however, the mild course of treatment before outlined should be carried out at the same time, since there is nothing in the one plan which in the least degree conflicts with the other.

In many cases, as the result of the extensive infiltration, or on account of a complicating œdema, the stenosis becomes so great as to demand tracheotomy. The propriety of this operation to relieve dyspnœa is of course beyond question. The temporary relief to the local symptoms, which in many cases seems to have followed opening the windpipe, has suggested the question whether tracheotomy might not be performed as a direct remedial measure in those cases in which no stenosis exists. Among the advocates of this measure we find Albers,[1] Dupuytren[2] in 1838, Fleury[3] in 1844, Obedenave[4] in 1866, Eugene and Jules Boeckel,[5] Serkowski,[6] Krishaber,[7] Schmidt,[8] Beverley Robinson,[9] and Ripley.[10] The ground on which the operation is advocated is in the benefit which results from the complete arrest of both the phonatory and respiratory movements of the larynx. Schmidt claims, still further, that a more complete oxygenation of the blood is secured by the free admission of air through a tracheal tube. Mackenzie,[11] on the other hand, states that the effect of the operation is, as a rule, only to prolong a miserable existence; while Cohen[12] regards it as neither directly nor indirectly curative, and as only justifiable in cases of dyspnœa. Moure[13] also disapproves of the measure. My own experience is limited to two cases, in which the trachea was opened, not on account of dyspnœa, but to relieve the distressing local symptoms in the larynx. The relief from pain and dysphagia was considerable in each case. Further than this, the operation was useless, in that life did not seem to be in any degree prolonged. In fifteen cases operated upon by Schmidt[14] he seemed to think that life was notably prolonged in five instances. In one of Ser-

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[1] "Die Path. und Ther. der Kehlkopf-Krankheiten," Leipzig, 1829.

[2] Cited by Beschorner: "Die lokale Behandlung der Laryngo-Phthisis tuberculosa.' Vortrag gehalten in der Gesell. für Natur- und Heilk. zu Dresden, Nov. 3d, 1888, p. 11.

[3] Cited by Beschorner. [4] Cited by Beschorner. [5] Cited by Beschorner.

[6] Przeg. Lekarsk., 1877, No. 13; Allg. med.-chir. Zeitung, Aug. 15th, 1878.

[7] Revue mens. de Laryngol., 1885, vol. viii., p. 383.

[8] Tageb. d. 59 Ver. Deutsch. Naturf. u. Aerzte, p. 284.

[9] Amer. Jour. of Med. Sciences, April, 1879.

[10] Cited by Robinson. [11] Op. cit., p. 377.

[12] "Diseases of the Throat and Nasal Passages," 2d ed., New York, 1879, p. 516.

[13] Op. cit. p. 205. [14] Cited by Gottstein: Op. cit., p. 262.

kowski's [1] cases the patient was living at the time of the last report, seven years after the operation, while another died three years after tracheotomy, the post-mortem examination revealing advanced pulmonary phthisis. The diagnosis in the first of these cases is open to serious question, while in the latter the result was certainly a most fortunate one. In Ripley's case, life was not only prolonged, but the patient relieved of suffering.

While, therefore, the operation is not one to be generally recommended, I do not think we are justified in condemning it in all cases, for in those instances in which the localized pain becomes extreme in character, and the difficulty and distress in swallowing becomes so great as to seriously interfere with the taking of food, if the patient's general condition is such as to warrant the operation, I think we may fully anticipate that the absolute rest which tracheotomy affords to the laryngeal movements will serve to markedly alleviate the local pain, and enable the patient to take food with much more comfort and ease.

Schroetter [2] very properly suggests that if the air passages are opened, the lower operation should be performed. This is true, whether the operation is done as a remedial measure or to relieve dypsnœa. If the trachea is opened to relieve dyspnœa, the operation should be done promptly, and without waiting until the stenosis becomes extreme.

E. Fränkel,[3] in reporting his case of primary tuberculosis of the larynx, suggests the question of the advisability of an extirpation of the organ. This question might possibly be worthy of consideration if there was an absolute certainty that the laryngeal invasion was primary and that no tubercle existed in any other organ of the body. In the absence of such certainty, I do not think the suggestion could be seriously entertained.

At the present writing, it is impossible to form any definite estimate as regards the special value of the injections of Koch's lymph in laryngeal tuberculosis. Browne [4] reports twenty cases which had been submitted to this treatment under his own observation and that of Krause and Gerhardt. In five of these he reports that actual healing took place; in nine, varying degrees of improvement occurred, in some absolute, and in others symptomatic; in four, progress was not reported, and in two there was no improvement. In the five cases of cure, the laryngeal disease was in the early stage, and very limited in extent, consisting of a moderate amount of infiltration of the commissure, or of small, shallow

[1] Loc. cit.

[2] "Vorlesungen über die Krankh. des Kehlkopfes," Wien., 1887, p. 165. [3] Loc. cit.

[4] "Koch's Remedy in Relation Specially to Throat Consumption," Phila., 1881.

ulcers on the vocal cords. The nine cases were instances of more advanced laryngeal tuberculosis. In these, there was not only improvement in the local condition, but improvement in the subjective symptoms. The disease, however, does not appear to have been arrested. In many instances, the injections seemed to result in a temporary aggravation of the local symptoms, causing a considerable degree of swelling, and in two an ulcerative process was established upon a previously existing infiltration. Moreover, three of these cases which Browne reports as healed are noted as having been in the service of Krause,[1] who, in making his own individual report of fourteen cases which had been subjected to the treatment, states that, while there was improvement in all, he did not feel justified in considering any case as completely cured, although he expresses the most hopeful views of the remedy in the early stages of the disease. B. Fränkel[2] reports five cases of the disease, in one of which the pharynx was involved; all improved by this plan of treatment, but no case was cured. Hertel[3] reports on eighteen cases, in sixteen of which there was a certain amount of improvement. A somewhat similar report is made by Lublinsky; Rosenbach[5] fails to observe any local effect of the remedy; while Charazac[6] is still more pronounced in his denunciation, in that he considers the danger of general tuberculization of the larynx under its influence a somewhat serious one.

Certainly the very striking effects which the lymph exerts upon tubercular processes demonstrates clearly that Koch has discovered a remedy of remarkable potency. Our present clinical experience shows it to be somewhat limited in its action, and its use liable to be followed by dangerous complications. Notwithstanding the fact that it has not fully justified the enthusiastic anticipations which were entertained with regard to it upon its first publication, further research will undoubtedly so far perfect the remedy that we shall have placed in our hands a method of successfully dealing with this most intractable of diseases. For the present, I think it is wiser to make use of it only in selected cases, and those in the earlier stages of the disease. Furthermore, it should only be used in the immediate presence of a physician, and with the most careful and continued observation. Even when used, I should not deem it altogether wise to fully abandon the plan of local treatment, already outlined above.

It is unnecessary here to enter upon a description of the composition of Koch's lymph further than to state that it is a glycer-

[1] Berl. klin. Woch., 1890, No. 49.
[2] Revue de Laryngol., 1891, vol. xii., p. 129.
[3] Deut. med. Woch., 1890, No. 48.
[4] Ibid.
[5] Deut. med. Woch., 1890, No. 49.
[6] Revue de Laryngol., 1891, vol. xii., p. 161.

ine extract, prepared by a somewhat elaborate process, from a pure cultivation of tubercular bacilli. As furnished by Koch's laboratory, it is a highly concentrated reddish-brown fluid, which is to be diluted for use in 100 parts of distilled and sterilized water. It is administered by an hypodermatic injection, the point of selection being the lower angle of the scapula. The injection is to be made under the strictest antiseptic precautions. The amount used usually at the first injection is one milligramme of the original solution, or a decigramme of the diluted preparation.

The action of the remedy is not directly on the bacilli, but on the tuberculous tissues wherever they may be, causing a localized necrosis, and ultimate sloughing away of the part. From this it will be easily appreciated how a tubercular process in the larynx, where the affected tissue is superficial, offers unusually favorable conditions for the action of the lymph, in that the process can be brought under direct ocular inspection. The occurrence of this local necrosis produces marked systemic disturbances, which often assume a dangerous character, especially where the affected tissue is deep seated. This systemic disturbance, which is usually spoken of as the "reaction" of the remedy, is characterized by the usual evidences of febrile movement, as shown by a temperature ranging from 100 to 103°, a rapid pulse, general depression, pains in the bones, etc.

Koch lays some emphasis on the diagnostic value of this reaction, in that, when tubercle is present in any tissue in the body, the reaction is notable, whereas if an injection of the lymph is followed by no reaction, it is to be considered as evidence that tubercular disease does not exist.

The injections may be repeated immediately on the subsidence of the reaction, or may be deferred for several days or a week, according to the subjective symptoms; furthermore, the amount used at subsequent injections may be gradually increased to as high as a decigramme of the original fluid.

A course of treatment consists in the repetition of the injections until finally no reaction is observed, the theory being that when no reaction follows an injection all tuberculous tissue has been either destroyed or rendered inert.

Following soon upon the publication of these observations of Koch, we find Liebreich[1] reporting somewhat remarkable results in tubercular disease, from the injection of the cantharidate of potassium. Liebreich's theory is that the local wasting of tissue which ensues from the presence of tubercle is the direct result of a lack of cell nutrition. The action of the cantharidate of potash

[1] Berl. klin. Woch., 1891, p. 238.

is to produce a serous exosmosis in those parts which are affected by tubercular infiltration. In this way, so abundant is the nutritive fluid that is supplied to the affected tissue that the cells receive sufficient vitality to successfully contend against the destructive action of the tubercular process.

Our clinical knowledge of the value of Liebreich's remedy is still less than that of Koch's, although favorable reports of its action on laryngeal phthisis have been made by Liebreich himself,[1] as well as by Fränkel,[2] Landgraf,[3] Lublinski,[4] and Heymann.[5]

J. Blake White[6] has reported some very favorable results in pulmonary phthisis by the hypodermatic injection of a combination of the chloride of gold and sodium with the iodide of manganese, although in none of his cases were the laryngeal tissues involved.

The rectal injection of sulphuretted hydrogen has not proven, in other hands, to possess the great efficacy in phthisis which Bergeon[7] claims for it, although he reports one case in which tubercular ulcers in the larynx cicatrized after an eight-months' course of treatment.

The indications for general treatment in a case of laryngeal disease are practically the same as of pulmonary phthisis, and need not be entered upon here. Of course no one will undertake the management of a case of laryngeal phthisis without availing himself of the beneficial effects which can be obtained from cod-liver oil, iron, general tonics, creasote, opiates, and other remedies whose action is to control the various distressing symptoms of the disease. Especial emphasis should be given, I think, to the great value of creasote in these cases. I do not fully indorse Robinson and others who advise that it should be given in doses even as high as 40 or 50 grains daily. I have seen the best results from the smaller doses, commencing with one grain and increasing the dose to two or three grains, given three times daily. The same may be said of the enforcement of certain hygienic rules, such as the use of the bath, the regulation of the clothing, the proper ventilation of the living and sleeping apartments, etc., and a change of climate where available.

One of the greatest difficulties with which we have to contend in these cases is the administration of a proper amount of food, on account of the pain with which deglutition is frequently attended. The great value of cocaine in producing temporary anæsthesia has already been referred to. An ingenious suggestion has been

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[1] Loc. cit. [2] Berl. klin. Woch., 1891, p. 249.
[3] Ibid., p. 271. [4] Ibid., p. 273. [5] Ibid., p. 243.
[6] New York Med. Record, 1891, vol. xxxix., p. 338.
[7] Acad. de Méd. de Paris, Sept. 2d, 1886.

made by Wolfenden,[1] who reports that one of his patients, in whom deglutition was unusually painful, found that he could take fluids with considerable ease by stretching himself prone upon his stomach, with the head lower than the feet, and sucking them through a tube. I have seen this method tried with great success. Of course, where necessary, the œsophageal tube can also be resorted to. Delavan[2] has devised a special apparatus for alimentation in this disease, which consists of a flexible catheter attached to a pumping apparatus, by which the food is forced into the stomach. The end is equally well accomplished by the ordinary nasal douche or fountain syringe, with a catheter attached.

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[1] Journal of Laryngology, 1887, vol. i., p. 317.
[2] Trans. Amer. Laryngological Ass'n, 1884, p. 81.

CHAPTER XXXIX.

LUPUS OF THE LARYNX.

THE development and clinical history of lupus in the upper air tract has already been so fully discussed in the chapter on lupus of the fauces that in the present consideration we confine ourselves to those features of the disease which have an especial bearing on the laryngeal invasion.

ETIOLOGY.—As already stated, the large majority of cases of lupus in the air tract develop secondarily to cutaneous lupus. After the fauces are invaded, the progress of the disease is usually from above downward, progressively involving the pharynx and larynx. Out of 79 cases collated in which lupus invaded the air tract, the skin was involved in 55; of these 55 cases, the mucous membrane was primarily affected in 3; in the remaining 52, the primary deposit was in the skin. Even where the mucous membrane is the primary seat of invasion, the disease still adheres to the course stated above, the pharynx being first involved, and subsequently the larynx. In only one case, that of Chiari and Riehl,[1] did the disease extend in the opposite direction, viz., from the larynx to the pharynx.

Not infrequently we find the larynx invaded secondarily to cutaneous lupus, and without involving the faucial tissues. Four instances of this kind have been reported by Haslund,[2] four by Browne,[3] two by Tobold,[4] two by Holme,[5] and one each by Mackenzie,[6] Chiari and Riehl,[7] and Türck.[8]

The primary invasion of the larynx is by no means such a rare occurrence as has been supposed. Garre,[9] in reporting a case, makes the statement that but one instance has been recorded in German literature. This case, it should be observed, was not really an instance of primary lupus of the larynx, as the base of the

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[1] Vierteljahresschrift für Derm. und Syph., Wien, 1882, p. 663.

[2] Vierteljahresschrift für Derm. und Syph., 1888, p. 470 *et seq.*

[3] "The Nose and Throat and their Diseases," 3d ed., London, 1890, pp. 430, 435, 436.

[4] "Laryngoscopie und Kehlkopf-Krankheiten," Berlin, 1874, p. 307.

[5] "Lupus affectionens Forhold tie Scrophulosen," etc., Kjöbenhavn, 1877.

[6] "Diseases of the Throat and Nose," Amer. ed., Phila., 1880, vol. i., p. 386.

[7] Loc. cit.

[8] Cited by Chiari and Riehl: Loc. cit., p. 675.

[9] Münchener med. Woch., Dec., 1889.

tongue was previously involved. Cases of primary laryngeal lupus have been reported by Haslund,[1] Ziemssen,[2] Jurasz,[3] Obertuschen,[4] Shields,[5] Stoerck,[6] Waldenburg,[7] and Chiari and Riehl.[8] A single instance of this, also, has come under my own observation: that of a young man aged twenty-eight, in whom the disease at the end of three and a half years had destroyed about two-thirds of the epiglottis and had infiltrated the ary-epiglottic fold and commissure (see Fig. 78). He suffered no special discomfort from the disease, other than in the vocal impairment. There was no involvement either of the skin or other portions of the air tract.

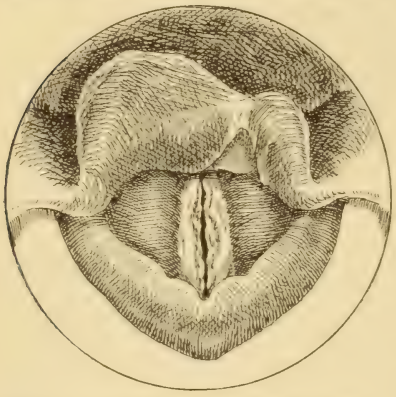

FIG. 78.—Lupus of the Larynx (author's case).

SYMPTOMATOLOGY.—The invasion of the larynx involves symptoms mainly referable to the voice and respiration. Pain in deglutition may occasionally be present, but is not a prominent symptom. The voice is impaired according as the disease invades the ventricular bands, the commissure, or the true cords. The encroachment upon the breathing space, giving rise to dypsnœa, is usually the most serious symptom which arises. In one of Haslund's[9] cases, that of a young girl aged seventeen, the disease progressed so rapidly that death from suffocation resulted in about four years after the first invasion. A laryngeal stenosis seems also to have been a prominent symptom in cases observed by Grossmann,[10] Ganghofner,[11] Shields,[12] and Haslund.[13] In the majority of instances, however, the disease expends itself in a slow but surely progressive destruction of tissue, rather than in tumefaction with encroachment upon the breathing space. Where stenosis occurs, it is dependent upon the infiltration of tissue, and not upon any complicating inflammation or œdema of the mucous membrane, in that these processes in no way belong to or accompany lupus, whether invading the air tract or other portions of the body.

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[1] Loc. cit.

[2] "Cyclop. of the Prac. of Med.," Amer. ed., New York, 1876, vol. vii., p. 853.

[3] Deut. med. Woch., 1879, No. 14.

[4] Centralblatt für klin. Med., Leipzig, 1883, vol. iv., p. 609.

[5] Trans. Med. Soc. of Virginia, Richmond, 1885, vol. xvi., p. 230.

[6] "Klinik der Krankheiten des Kehlkopfes," Stuttgart, 1880.

[7] "Die lokale Behandlung der Luftröhre," Berlin, 1872. [8] Loc. cit.

[9] Loc. cit., case 4. [10] Allg. Wien. med. Zeit., 1877, vol. xx., p. 182.

[11] Prag. med. Woch., 1880, Nos. 37 and 39. [12] Loc. cit. [13] Loc. cit., case 10.

Beringier[1] reports a case in which an œdema of the larynx suddenly supervened upon lupus of the nose. This writer seems to infer that the œdema was a complication of a coincident laryngeal lupus. He presents no evidence, however, of a previously existing lupus of the larynx; hence, I think it is fair to conclude that the œdema was the result of causes remote from and unconnected with the nasal disorder.

DIAGNOSIS.—The recognition of the disease is based on the same general rules as those already given in the discussion of the faucial disease. It usually attacks primarily the epiglottis, and slowly extends downward to the ary-epiglottic folds and ventricular bands, producing thickening of tissue, distortion of contour, and impairment of function. Ulceration here is no more a prominent feature of the morbid process than in the parts above. There is no hypersecretion and no distinctly apparent ulcerated surface. The tissues seem to waste away by a slow process of erosion, which involves both the mucous membrane and fibro-cartilage of the epiglottis. When it extends as far as the commissure and to the neighborhood of the hyaline cartilages, we find the same process of erosion and destruction of tissue; but never, I think, is there set up perichondritis with necrosis, such as occurs in the ordinary form of tubercular disease.

PROGNOSIS.—Lupus of the larynx is characterized by the same chronicity which attends a similar process in the parts above, and practically the prognosis is the same, except so far as it involves the danger of laryngeal stenosis and death from suffocation. Regarding this latter as a danger easily averted by tracheotomy, the disease is not one which involves any great danger to life.

The prognosis as regards the arrest of the disease or ultimate cure is practically the same as that already given in regard to the faucial lupus.

No case of spontaneous cure, as far as I know, has been recorded, although a number of instances have been reported in which the disease was arrested when promptly attacked by proper measures in the early stages of its development.

It would seem that lupus of the larynx manifests its danger of causing stenosis comparatively early in its history. If, therefore, a case has shown no tendencies in this direction at the end of two or three years, it becomes a somewhat nice question to decide as to what its dangers are. It does not disappear, and, again, it does not tend toward a fatal issue. In the two cases which have come under my own observation, I have been at a loss to decide why my

[1] Annal. des Mal. de l'Oreille, 1878, vol. iv., p. 172.

prognosis should be unfavorable or what dangerous tendencies were liable to develop.

TREATMENT.—The general indications for treatment have already been sufficiently discussed in the previous chapter, on Lupus of the Fauces. As regards the laryngeal disease, nothing further need be said, other than the suggestion that where dyspnœa becomes in any way a prominent symptom a tracheal tube should be inserted without unnecessary delay.

A laryngeal stricture as the result of lupus would seem to constitute a form of stenosis particularly favorable for the use of dilating bougies, in that the tissue is tolerant, and, if observed before extensive cicatrization has occurred, not very dense or resisting. Ganghofner's[1] case was treated by the solid stick of nitrate of silver and the galvano-cautery, and at the same time subjected to a systematic course of dilatation by Schroetter's bougies. He regards the stenosis as having been thoroughly overcome at the end of two months.

I know of no case treated by intubation, and am disposed to think that the distortion of the parts would render it difficult to maintain the tube in place.

The injection of tuberculin, cantharidate of potash, and remedies of this kind has already been alluded to in the previous chapter.

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[1] Loc. cit.

CHAPTER XL.

NEUROSES OF THE LARYNX.

In the consideration of laryngeal neuroses we are confronted at the outset with no little difficulty in deciding upon a definite classification. Cohen,[1] Ziemssen,[2] and Mackenzie[3] adopt a classification, which is based mainly on anatomical distinctions, although, in his later work Mackenzie[4] classifies the laryngeal neuroses on pathological distinctions, dividing the various diseases according as they are dependent upon morbid conditions, respectively, of the medulla, the spinal accessory, the pneumogastric, the superior laryngeal and the recurrent laryngeal nerves, and of the muscular structures—a plan which was also adopted by Moure.[5] The objection to this classification lies in the fact that from a clinical point of view those paralyses which are dependent upon a diseased condition or injury of the recurrent nerve differ in no essential degree as far as the laryngeal manifestations are concerned, from those which are dependent upon a disease or injury of the pneumogastric or spinal accessory nerve, or of the medulla. Without attempting, therefore, any definite classification, we simply group our neuroses according to the clinical manifestations. In this way we shall consider—

First.—Sensory neuroses, viz.: Hyperæsthesia, paræsthesia, anæsthesia, and neuralgia.

Second.—Paralysis involving the nerve trunk or nerve centre, as follows: Superior laryngeal paralysis; recurrent laryngeal paralysis; bilateral paralysis of the abductors; and unilateral paralysis of the abductors.

Third.—Paralysis of individual muscles. These are: Unilateral paralysis of the tensors; bilateral paralysis of the tensors; unilateral paralysis of the adductors; bilateral paralysis of the adductors; and paralysis of the arytenoideus muscle.

Fourth.—Functional neuroses, the only affection coming under this head being hysterical aphonia.

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[1] "Diseases of the Throat and Nasal Passages," New York, 1879, p. 637.

[2] "Cyclopædia of Med.," Amer. ed., New York, 1876, vol. vii., p. 914.

[3] "Hoarseness and Loss of Voice," Amer. ed., 1869, p. 183.

[4] "Diseases of the Throat and Nose," Amer. ed., 1880, p. 407.

[5] "Leçons sur les Mal. du Larynx," Paris, 1890, p. 275 *et seq.*

Fifth.—Spasm of the glottis. The clinical history and significance of this affection differ so essentially, according as it manifests itself in child life and adult life, that it seems wise to consider it under the two heads of spasm of the glottis in children and spasm of the glottis in adults.

Sixth.—Inco-ordination of the laryngeal muscles, including under this head: Chorea of the larynx; aphonia and dysphonia spastica; and laryngeal vertigo.

Hyperæsthesia.

Undue sensibility of the larynx occurs in connection with acute laryngitis and other inflammatory affections of the organ, and thus frequently in connection with chronic catarrhal processes. It is an especially prominent feature of laryngeal phthisis and in some cases of carcinoma. In syphilis, on the other hand, the sensibility is usually diminished. It also occurs in connection with chronic catarrhal pharyngitis, and is especially common in the pharyngitis which results from the intemperate use of alcohol. The reflex sensibility of the larynx varies notably in different individuals, and a certain amount of hyperæsthesia may occur in individuals of a peculiarly nervous temperament. In the very large majority of instances, however, it is purely symptomatic, and possesses no points of special clinical interest as an independent affection.

Anæsthesia.

Complete abolition of sensation in the larynx can only be due to some involvement of the superior laryngeal nerve, although diminished sensibility is not infrequently met with in chronic inflammatory processes of long standing. It also occurs in syphilis, and may be one of the sequelæ of diphtheria. The tolerance of instrumentation in hysterical females is well-known. It may also be present in the general paralysis of the insane, in cases of tumor at the base of the brain, the early stages of tabes dorsalis and other affections of the medulla.

Paræsthesia.

By this term we designate certain perverted sensations, such as tickling, irritation, a constant desire to swallow, or the feeling as of a foreign body impinging upon the parts. Undoubtedly in the large proportion of these cases, a careful investigation will reveal some organic lesion to account for the symptoms, such as an hypertrophied lingual tonsil, enlarged pharyngeal glands, a morbid condition of the naso-pharynx, cheesy matter in the faucial tonsil, etc. We constantly

meet with cases in which a tickling or sense of irritation, producing cough, is referred directly to the larynx, wherein the real source of the trouble lies in the passages above. Patients suffering from impairment of the general health from anæmia or phthisis, are especially liable to these perverted sensations, as well as individuals of nervous temperament. This was especially noticeable during the late illness of the German emperor and of General Grant, during which time we were constantly called upon to assure nervous patients that some obscure and irregular sensation referable to the larynx was not due to a commencing malignant disease. In many instances these symptoms were purely imaginary, while in others they were the result of some slight morbid lesion, either in the larynx or still more frequently in some other portion of the air tract. These cases illustrate the very close relation which the different portions of the upper air tract bear to one another, and emphasize the teaching that any symptom referable to these parts demands a close and careful inspection of the whole area to determine and eliminate such morbid conditions as may be discovered in any portion.

Neuralgia.

While pain referable to the region of the larynx is by no means an uncommon symptom, in most instances it can be traced directly to some morbid lesion of an organic character, either in the larynx itself or in the adjacent passages. It may also be due to an anæmic condition, rheumatism, or gout, and is a prominent feature in ulcerative processes, such as phthisis and carcinoma. It is rarely or never present, however, in syphilis and lupus. The pain which occurs in connection with acute inflammatory troubles, and more markedly in perichondritis and traumatism, while a prominent symptom, need scarcely be considered in this connection. Chapman [1] has reported a series of four cases in which laryngeal neuralgia was a prominent feature of malarial poisoning. The pain was mainly internal, while there was notable tenderness on pressure externally. The laryngoscopic appearances were perfectly normal. Complete relief followed the administration of iron and quinine. Schnitzler reports a somewhat curious case which seems to have been almost purely neuralgic in character. The patient was a gamekeeper, aged thirty-six, who had hyperalgesia both of the larynx and pharynx, following an attack of angina. The pain was of such an intolerable character that he was driven to the verge of suicide. The pain was accompanied by a curious sense of violent

[1] Trans. of the Amer. Laryngol. Ass'n, 1887, p. 136.

[2] Wiener med. Presse, 1873, Nos. 46 and 48, pp. 1,049 and 1,106.

contraction in the throat, which compelled him to draw deep inspirations in order to assure himself of his ability to breathe. A cure was effected at the end of a month by brushing the cavity of the larynx with a solution of chloroform and morphine. A somewhat similar case came under my own observation a few years ago. I was summoned to a neighboring city with the request to bring instruments for the performance of tracheotomy in a very urgent case. I found a man aged thirty-five suffering from intense pain in the larynx, with a feeling of contraction about the throat, which, while not causing dyspnœa, gave rise to a feeling of imminent suffocation. A laryngoscopic examination revealed the larynx in perfect health and the movements of the glottis normal. There was a notably hyperæsthetic condition of the fauces, which rendered the examination somewhat difficult. The source of the difficulty seemed to be an attack of acute naso-pharyngitis. The prominent neuralgic symptoms were explained by the fact that the patient was of an intensely nervous habit. He was completely relieved by the administration of aconitia, one-five-hundredth of a grain every two hours, until the characteristic symptom of tingling in the fauces was produced. In this case the laryngeal pain seemed to have been purely neuralgic in character, being paroxysmal, while in Schnitzler's case the paroxysmal element, so characteristic of pure neuralgia, was absent.

The prominent indication for treatment of neuralgia of the larynx, as well as of hyperæsthesia and paræsthesia, consists in the removal of such contributing causes as can be discovered in any portion of the air tract. In the large majority of instances this is all that will be necessary. In those cases in which the impairment constitutes an independent neurosis, our best results will be obtained by such general measures as serve to tone up the nervous system. Among these are to be enumerated the judicious use of the cold bath, sea-bathing, friction to the skin, exercise, or possibly a change of climate. If indications exist, the treatment can be aided by the use of some preparation of iron, strychnine, arsenic, or zinc, or a combination of the above.

Paralysis of the Superior Laryngeal Nerve.

This nerve supplies sensory innervation to the mucous membrane lining the larynx, and motor innervation solely to the cricothyroid muscle, and in part to the arytenoideus. Complete superior laryngeal paralysis, therefore, would result in an abolition of sensation of the mucous membrane of the laryngeal cavity, while at the same time the tension of the cords, and the approximation

of the arytenoid cartilages, would be seriously impaired. An interesting case of this kind has been reported by Heymann. The patient was a young man who presented with paralysis of the constrictor muscles of the pharynx, rendering him unable to swallow. A careful investigation of the case showed that there was complete abolition of sensation of the mucous membrane lining the larynx, as demonstrated by the introduction of a probe, while at the same time on laryngoscopic examination the cords were found to be in a notably relaxed condition, the glottis assuming the form of an ellipse, which extended to the vocal processes, behind which the cartilaginous glottis was open; in other words, the tensor function of the crico-thyroid muscle was abolished, as well as the ability to approximate the arytenoids. The adductor function being intact, the vocal processes were rotated inward in such a way as to divide the glottic opening into two parts, forming an ellipse anteriorly and a triangular opening posteriorly, as seen in Fig. 79. The voice was weak and at times almost aphonic. The pharyngeal paralysis was of such a character as to necessitate feeding with a tube. Under the administration of general tonics, with local faradization, the patient subsequently recovered. It is unnecessary to add that in this case both superior nerves were involved. No suggestion is made as regards the cause of the attack.

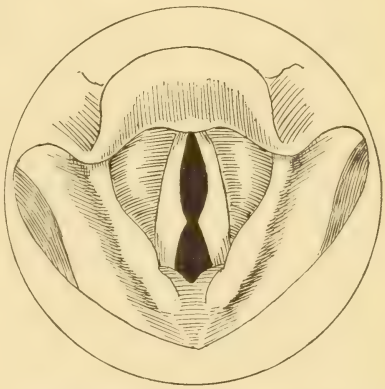

FIG. 79.—Bilateral Paralysis of the Superior Laryngeal Nerve.

Neuman[2] reports the case of an attempted suicide in which the superior laryngeal nerve was divided. In this case the lack of tension was shown by the bulging of the cord of the affected side above its fellow, in the act of phonation, although the arytenoid approximation was fairly well accomplished, the arytenoideus muscle deriving sufficient innervation from the nerve of the opposite side. An especially annoying feature of this case was the accumulation of mucus in the laryngeal cavity, which the patient found great difficulty in expelling.

Creveling[3] reports an instance of section of this nerve during an operation upon a cervical tumor, giving rise to tensor paralysis of that side, causing a hoarseness and weakness of the voice, which

[1] Deut. Arch. für klin. Med., 1888–89, vol. xliv., p. 586.
[2] Berliner klin. Woch., 1891, p. 141.
[3] Journ. Amer. Med. Ass'n, October 11th, 1890, p. 533.

persisted for many months. This patient also suffered from difficulty in deglutition, although not in so marked a degree as in Heymann's case. This is probably explained by the impairment of sensibility of the pharyngeal mucous membrane, which derives sensory innervation from this nerve, both directly and through the pharyngeal plexus.

Another case reported by Creveling is of interest in this connection in that by cutting down upon and stretching the superior laryngeal nerve, he succeeded in relieving a patient, a female aged seventeen, of a distressing form of choreic movements of the larynx, from which he argues that this nerve has a somewhat important bearing on spasmodic affections of this organ.

A number of cases have been collated by Leube[1] and Acker[2] in which the affection occurred as one of the sequelæ of diphtheria, the prominent feature of which consisted in impairment of sensation of the laryngeal mucous membrane, together with vocal weakness, the result of imperfect tension of the cords. In some of the cases there was difficulty in deglutition, and food made its way into the larynx. It is probable that this symptom was the result of a paralysis of the faucial muscles, so common after diphtheria: certainly it is difficult to understand how sensory paralysis of the laryngeal cavity should act in such a way.

In cases reported by Johnson[3] the affection was observed following typhoid fever, and also as a manifestation of hysteria.

The clinical features of the disease are fairly well illustrated in the cases above reported. As we have seen, it may involve either one or both sides of the larynx. In the latter instance it produces paralysis of the tensor muscles of the larynx as well as of the arytenoideus, together with impaired sensation. Where the affection is unilateral, however, the arytenoideus paralysis is usually not apparent.

The diagnosis will depend upon a careful analysis of the laryngeal movements as seen by the laryngoscopic mirror, together with a testing of the sensation of the parts by the introduction of a probe.

I know of no lesion which will produce the curious glottis which is observed where both the superior laryngeal nerves are paralyzed, viz., that in which the chink is divided by the approximation of the tips of the vocal processes. If the paralysis is unilateral, the laryngoscopic image simply shows a relaxed condition of that portion of one of the vocal cords which extends from the vocal process to the

[1] Deut. Arch. für klin. Med., 1869, vol. vi., p. 266.
[2] Deut. Arch. für klin. Med., 1874, vol. xiii., p. 416.
[3] N. Y. Med. Jour., 1885, vol. xlii., p. 357.

thyroid cartilage. This condition might be the result of paralysis of the crico-thyroid muscle. The impairment or absence of sensation in the lining membrane of the larynx in such a case should indicate, however, a lesion of the superior laryngeal nerve.

These cases generally recover; the duration of the affection, however, is dependent on its exciting cause. If it follows diphtheria, we may anticipate complete recovery at the end of from one to two months. In Creveling's case of section of the nerve, complete restoration of voice does not seem to have occurred until the end of about twelve months.

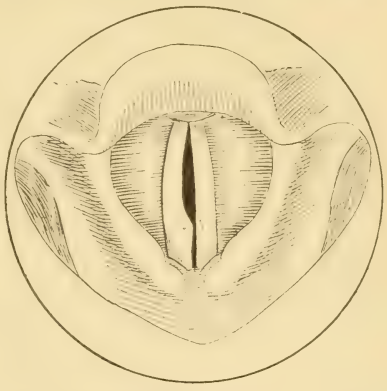

FIG. 80.—Unilateral Paralysis of the Superior Laryngeal Nerve.

The treatment of the affection consists in the administration of general tonics, strychnia, friction, massage, and local faradization, with such general hygienic measures as may seem to be indicated.

RECURRENT LARYNGEAL PARALYSIS.

This nerve supplies motor innervation to all the muscles of the larynx except the crico-thyroid. As the result of its paralysis, therefore, we have practically a complete abolition of motion on the side of the larynx involved; for although, as we know, the contractility of the crico-thyroid muscle is still preserved, yet, where all the other muscles of the larynx are paralyzed on that side, it is practically impossible for the crico-thyroid to exert any appreciable influence.

ETIOLOGY.—In the very large majority of cases which come under our observation, this affection is due to pressure exerted upon the nerve trunk in some portion of its course. On the left side, passing, as it does, around the arch of the aorta, it seems to be exceedingly liable to become involved in aneurismal dilatations of this vessel. Our first suspicion always, in discovering a left recurrent paralysis, especially in a patient in the later years of life, is that it may be due to aneurism. While this latter affection not infrequently gives rise to it, it is probably a mistake to regard it as the most frequent cause.

Referring to my notebook, I find I have recorded in private practice, exclusive of hospital cases, fifteen instances of this lesion, in four of which it occurred on the right side and in eleven on the

left. The ages varied from seventeen to sixty-eight. Eleven were males and four females. But four of these were the result of aneurism. In one, a man aged fifty-five, this was the only surviving symptom of what I regarded at the time as cerebral embolism, the paralysis occurring on the right side. The patient died a few months later, with complete left hemiplegia. Embolism was also the cause of the disease in another case, a patient aged thirty-three, the paralysis being on the left side. In one case, a man aged twenty-five, it seemed to have been the result of an attack of diphtheria twenty-two years previously. In a man aged sixty-four, paralysis of the left side occurred in connection with stricture of the œsophagus. In a boy aged seventeen, a left paralysis seemed to have followed an attack of whooping-cough. In two patients, I have observed the left cord completely paralyzed, and lying in the cadaveric position, during an ordinary attack of acute naso-pharyngitis with laryngitis, the condition disappearing at the end of a few days. One of these patients was a young lady aged nineteen, and the other a gentleman of sixty-eight. Certainly in the latter case the paralysis foreboded no evil, in that he is still, after the lapse of several years, in the enjoyment of perfect health. The observation certainly was a curious one, and I have no suggestions to make in explanation of it.

The above list of cases perhaps affords a fair estimate as to the ordinary causes of the disease. In many instances it is due to direct pressure on the trunk of the nerve. The fact of its occurring with greater frequency on the left side than the right is probably to be explained by the longer and more exposed course which the nerve pursues on the left side.

We thus find that this form of paralysis may occur as the result of central lesion, lesion of the trunk of the nerve, or from peripheral causes. In two of my own cases, we have seen, the paralysis was due to central lesion, one occurring on the right side and the other on the left. Jackson[1] reports a case of central lesion resulting in paralysis of the right side of the larynx. In a second case by the same author[2] there was paralysis of both nerves. In a third case by the same observer[3] there was paralysis of the left cord. In a fourth by the same writer[4] there was paralysis of the right nerve. In a case reported by Proust[5] there was paralysis of both cords. In a case reported by Senator,[6] also, there was paral-

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[1] London Hospital Reports, 1864, vol. i. [2] Op. cit., p. 368.
[3] Ibidem, 1867, vol. iv., p. 314. [4] Op. cit., p. 318.
[5] Cited by Hallopeau: "Des Paralyses bulbaires," Paris, 1875, case No. 23.
[6] Arch. für Pyschiatrie, vol. xi.

ysis of both cords. Eisenlohr[1] reports three cases, in two of which there was recurrent paralysis on both sides, while in the third the paralysis occurred on the left side. Sokaloff[2] also reports a case of left recurrent paralysis from central lesion.

All these cases terminated fatally, and post-mortem examinations were made in all, with the exception of my own and Jackson's first two cases. The lesion in every case was found to be extensive destruction of the medulla, involving the pyramids, the olivary bodies, the restiform bodies, and the floor of the fourth ventricle. The central lesion may be either hemorrhage, embolism, endarteritis, disseminated sclerosis, or the ascending sclerosis of locomotor ataxia. In most instances, probably, this latter form of disease gives rise to abductor paralysis of one or both sides, and yet Oppenheim[3] reports a case of right recurrent laryngeal paralysis occurring in connection with locomotor ataxia; while Kahler[4] reports a case in connection with this disease in which the paralysis was on the left side. A similar case was reported by Hubbard.[5]

That form of paralysis which is due to lesion of the nerve trunk is probably the most frequent of all, and, as we have seen, occurs in the majority of instances on the left side. It is the result of pressure from aneurism, enlarged lymphatic glands, or other neoplastic development in the course of the nerve, such as mediastinal tumors, cancer of the œsophagus, etc. Riegel[6] reports a case in which pressure on the left nerve was exerted by a dilated pulmonary artery, as discovered post mortem, the symptom having previously been regarded as due to an aneurism. Baeumler[7] reports a case in which a pericardial effusion caused pressure on both recurrent nerves, giving rise to a bilateral paralysis.

The pleuritic adhesions which develop in incipient phthisis may give rise to pressure on the nerve, causing paralysis. This usually occurs on the right side, the pleura extending somewhat higher on this side than the left, although Johnson[8] reports an instance of this kind occurring on the left side. Gerhardt[9] reports an instance in which the paralysis was the result of a serous effusion in the pleural cavity, and which promptly disappeared on the resorption

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[1] Deutsche med. Woch., 1886, p. 363; also Arch. für Pyschiatrie, 1887 and 1888, vol. xix., p. 314.

[2] Deutsche Arch. für klin. Med., vol. xli., p. 458.

[3] Berl. klin. Woch., 1886, No. 40, p. 675.

[4] Zeits. für Heilkunde, 1881, vol. ii., p. 440.

[5] Toledo Med. and Surg. Reporter, 1889, vol. ii., p. 576.

[6] Cited by Schabert: Journal of the Amer. Med. Ass'n, 1890, vol. xv., p. 897.

[7] Deutsche Arch. für klin. Med., 1866–67, vol. ii., p. 550.

[8] Trans. of the Amer. Laryngol. Ass'n, 1885, p. 86.

[9] Arch. für path. Anat., Berlin, 1863, vol. xxvii., p. 310.

of the serum. In those cases of this form of paralysis which followed diphtheria, typhoid fever, and other of the exanthemata, the lesion, as in other forms of paralysis following these affections, was primary and the result of the blood poison, exciting a neuritis and involving the nerve centres, the nerve trunk, or the terminal filaments. The local inflammatory process, however, exercises an undoubted influence. In two of my own cases there was an ephemeral paralysis of the recurrent nerve, occurring in acute naso-pharyngitis accompanied by laryngitis. Somewhat similar cases have been observed by Johnson.[1] We can only suggest in regard to these that the terminal filaments of the nerve were involved in the local morbid process. Johnson[2] has also reported a case of hysterical aphonia in which the cords assumed the cadaveric position. In this disease, as we shall see later, the local condition is not one of paralysis, but lack of volitional effort, and, while the cords may lie somewhat in the cadaveric position, a certain amount of motion can be observed. As a rule, a double recurrent paralysis will be accepted as evidence of central lesion, although it may occur, of course, from coincident pressure on both nerve trunks, instances of which have been noted above, as in Baeumler's case, already referred to, of pericardial effusion. Still more unique cases, constituting rare coincidences, are those reported by Ziemssen,[3] Traube-Munk,[4] and Baeumler, in which there was a double paralysis, that on the left being the result of an aortic aneurism, and that on the right of an innominate and subclavian aneurism. In most instances, however, the existence of a double recurrent paralysis should lead us to suspect the existence of some central lesion. Johnson and Baeumler have reported cases in which pressure upon the pneumogastric nerve of one side has given rise to bilateral paralysis of the recurrent nerve. I quite agree with Gottstein[5] in the view that in these cases the pressure on the pneumogastric sets up organic changes of the nerve centre, and that in this way the double paralysis really resulted from a central lesion.

PATHOLOGY.—The degenerative changes which take place in the nerve as the result of paralysis are simply those which occur from a permanent interruption of the nerve current, either from pressure on the trunk or destruction of the centre. These degenerative changes also extend to the muscular structures which are supplied by the nerve, which undergo atrophy simply from their inactivity.

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[1] Loc. cit., p. 82. [2] Loc. cit.

[3] "Cyclop. of the Practice of Med.," Amer. ed., vol. vii., p. 945.

[4] Deutsche Klinik, 1860, No. 41; 1861, No. 27.

[5] "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888.

SYMPTOMATOLOGY.—If the paralysis is unilateral, its onset is marked by a notable degree of impairment of the voice, which becomes weakened rather than hoarse. The cord of the paralyzed side lying in the cadaveric position, increased effort is demanded on the part of the muscles of the opposite side to bring the vocal cord into position for phonation. Hence, the mere effort at talking becomes exceedingly wearisome. After a few weeks, however, the voice gradually improves, as the larynx adapts itself to the new conditions. The cord of the opposite side is finally so trained, as it were, that it can be brought around into apposition with its paralyzed fellow, in such a way that ordinary conversation is carried on with ease. The cord of the paralyzed side, however, is somewhat relaxed; hence, prolonged conversation becomes something of an effort, while the range of voice is necessarily impaired. The higher notes, of course, as in singing, cannot be taken, with this impairment of tension and distorted condition, as it were, of the glottis. As a rule, after a unilateral recurrent laryngeal paralysis has existed for some months, it is impossible to detect, in ordinary conversation, any symptom which would call attention to an impairment of laryngeal innervation. If, on the other hand, the paralysis is bilateral, the voice is completely lost. The cords remaining widely separated in the larynx, the setting up of vibrations becomes, of course, an impossibility. The patient talks in a labored whisper, the prominent feature of which is in the phonatory waste. In the attempt at phonation the air escapes so rapidly through the glottis that the patient is compelled to stop and recover his breath at the end of every two or three words. In this manner, conversation becomes not only wearisome, but exceedingly exhausting.

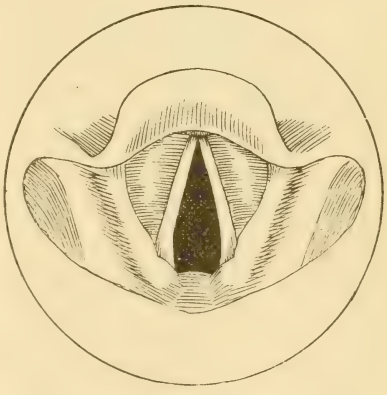

FIG. 81.—Cadaveric Position of the Cords, as in Bilateral Paralysis of the Recurrent Laryngeal Nerve.

Any other symptoms which attend this form of paralysis, whether unilateral or bilateral, such as dyspnœa, cough, etc., must be attributed to other conditions than the simple laryngeal paralysis, this latter really being, as we see in the very large majority of instances, merely a symptom of some other more serious affection.

DIAGNOSIS.—The existence of this form of paralysis is easily recognized on laryngoscopic examination. If both sides of the

larynx are affected, the cords are seen lying motionless in a position midway between adduction and extreme abduction; in other words, in the cadaveric position (see Fig. 81). The only affection with which it can be confounded is a bilateral paralysis of the adductors, in which both cords are observed widely separated and burying themselves, as it were, in the lateral walls of the larynx. The difference in the laryngeal images lies mainly in the fact that in adductor paralysis the cords are not only more widely separated, but the vocal processes are swung outward in such a way as to produce a somewhat concave appearance of the vocal cords, while in the cadaveric position the vocal process is seen slightly projecting in the direct line between the arytenoid and the receding angle of the thyroid. If the paralysis is unilateral, the vocal

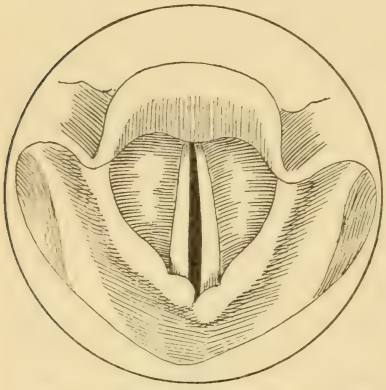

FIG. 82.—Right Recurrent Paralysis during Phonation.

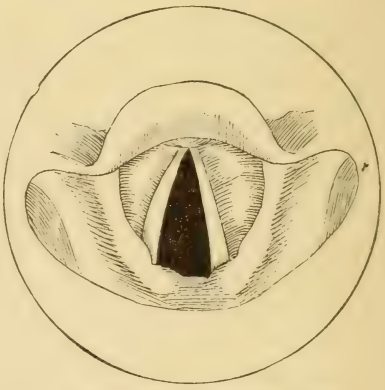

FIG. 83.—Right Recurrent Paralysis during Inspiration.

cord of the affected side will be seen lying in the cadaveric position, while that of the healthy side will be found moving not only throughout its normal arc, but in adduction it passes beyond the median line and swings over to meet its fellow, for purposes of phonation. In this act the arytenoid cartilage of the healthy side passes slightly in front of the opposite cartilage, as seen in Fig. 82.

The diagnosis will depend, then, on this peculiar position of the two arytenoids during phonation with reference one to the other, and the obliquity of the rima glottidis, which is deflected from before backward toward the paralyzed side. This is easily seen if the laryngeal mirror be so arranged in the fauces that the centre of the crest of the epiglottis is brought in a directly straight line with the centre of the arytenoid commissure during inspiration. If, now, the patient be directed to phonate, the narrowed chink of the glottis will be seen in an oblique line, while at the same time the

cord of the paralyzed side will be observed to lie motionless in the cadaveric position. It is to be borne in mind always, in making this examination, that not infrequently we meet with an epiglottis standing so obliquely as that the centre of its crest will deviate several degrees from the median line. Curiously enough, if we align the laryngeal mirror with an oblique epiglottis, we will get an exceedingly deceptive laryngoscopic image, and one which will oftentimes give the appearance of recurrent paralysis. In such a case we adjust our mirror in the median line of the fauces by the eye, aligning it upon the soft palate and pharynx.

We should always recognize the fact that, having discovered a laryngeal paralysis, our diagnosis is by no means complete, and our best diagnostic skill will in most instances be required to determine the direct cause of the paralysis. This will involve a most careful inspection and examination of the thoracic organs by means of auscultation and percussion, of the cervical region by palpation and inspection, and of the nervous system by close questioning and other tests.

PROGNOSIS.—If the disease is the result of peripheral neuritis, as in diphtheria, one of the exanthems, or an attack of acute inflammation, the prognosis is good, and recovery from the paralysis may be anticipated in the course of from three to six weeks. If, on the other hand, it is due to pressure on the nerve trunk or to a central lesion, the laryngeal paralysis is to be regarded merely as symptomatic of the affection which has given rise to it, and the prognosis will be decided entirely upon the features of the more serious affection. If the condition which has caused the paralysis be a curable one, the prognosis as regards restoration of motility in the larynx will depend entirely upon the duration of the laryngeal symptoms. Clinical experience teaches us that after a paralysis has existed for twelve months or even longer, the conductivity of the nerve may in rare instances be restored; but the muscles which this nerve has supplied, as the result of their inactivity, undergo atrophic changes, which at the end of from six to nine months usually have reached such a stage that the hope of their restoration becomes somewhat doubtful.

TREATMENT.—If the disease is the result of an ordinary inflammatory process of the upper air passages, this should be actively attacked by topical applications of an astringent character, to bring it under control as rapidly and as thoroughly as possible. If it is caused by diphtheria or one of the exanthems, it should be treated by the internal administration of general tonics and strychnia, in the same manner as the other paralytic sequelæ of these diseases. Where it is due to disease of the nerve trunk or centre, the

indications for treatment will depend entirely upon the ascertained cause of the paralysis.

Of course, electrical stimulation is absolutely useless unless the cause of the affection can be removed. The only indication for resort to this measure is in the hope of maintaining the muscular structures in a healthy condition until the cause has been removed. When the paralysis is the result of an aneurism or other incurable affection, it is idle to hope for any beneficial effect from electricity. Where, however, there is any promise of relieving the pressure on the nerve trunk by the removal or dissipation of the offending tumor, electrical stimulation should be followed up systematically until this is accomplished. This may be done by applying one pole of the battery to the nape of the neck, and passing the other over the laryngeal region in front, or, better still, by passing the electrode directly into the laryngeal cavity and as far as possible stimulating successively the various paralyzed muscles. This is accomplished, with comparative ease, with the aid of cocaine anæsthesia. The faradic current should be used first, and in most cases answers the better purpose. If, however, the continued current shows a better reaction, as it occasionally does, this should be substituted.

At best, the cases of recurrent paralysis which will be in any way benefited by electrical stimulation are exceedingly rare. The indiscriminate use of this agent in every case of laryngeal paralysis cannot be too severely condemned, for it is undoubtedly capable of doing no little mischief, by exciting irritation and inflammation of the parts, while at the same time the strength of the patient suffering from some grave internal disease may be taxed in no small degree by the frequently repeated sittings which are often imposed. It should, I think, never be used unless there are clear indications and a fair promise of good to be accomplished.

Bilateral Paralysis of the Abductor Muscles.

The muscular movements by which the opening of the glottis is accomplished during inspiration constitute what is called the respiratory function of the larynx, and depends solely upon the action of the posterior crico-arytenoid muscles. This function, as we know, consists in the separation of the vocal cords during the act of inspiration, and is presided over by distinct nerve centres in the medulla. This form of paralysis, as involving both sides of the larynx simultaneously, occurs in such a large class of cases that it merits consideration as an affection distinct from the unilateral form of the disease.

ETIOLOGY.—No other form of laryngeal neurosis has been the subject of more active investigation and discussion than that of abductor paralysis.

That this disease occurred before the days of laryngoscopy cannot be questioned, yet a diagnosis can only be established by a physical examination; hence, our recognition of the affection dates from comparatively recent times. The disease still is an exceedingly rare one, Mackenzie, in his earlier work, reporting but a single case, while Ziemssen [1] had collated nine cases. Mackenzie,[2] in his later publication, reports having observed sixteen cases, while in a study of the subject made by myself in 1881[3] thirty cases were collated. In the same year Semon [4] added to our knowledge of the subject by a paper based on an analysis of twenty-two cases. In addition to this, valuable contributions have been made by Krause,[5] Eisenlohr,[6] Sokaloff,[7] B. Fränkel,[8] Jean,[9] Senator,[10] Biermer,[11] Oppenheim,[12] Ollivier d'Angers,[13] Gerhardt,[14] Stephen Mackenzie,[15] Saundby,[16] and others.

We thus find that there are three views which have been advanced to account for this curious disease:

First.—That it is due to a peripheral lesion;

Second.—That it is due to a morbid lesion in the continuity of the nerve; and

Third.—That it is due to a central lesion.

First.—As regards the peripheral lesion: Mackenzie,[17] in his earlier work, states that the cause of the disease is generally cerebral, "but morbid influences which affect both pneumogastric or both recurrent nerves may give rise to it"; while in his later work [18] he makes the suggestion that owing to the exposed situation of the abductor muscles on the posterior aspect of the larynx, they are especially liable to become the seat of injury, which added to the fact of their ceaseless activity, renders them vulnerable, and sug-

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[1] "Cyclopedia of Prac. of Med.," New York, 1876, vol. vii., p. 959.

[2] "Diseases of the Throat and Nose," Amer. ed., 1880, vol. i., p. 442.

[3] N. Y. Med. Jour., Nov., 1880. [4] Arch. of Laryngology, vol. ii., p. 197.

[5] Neurologisches Centralblatt, 1885, p. 543. Berlin. klin. Woch., 1886, No. 20, p. 651. Journal of Laryngology, July, 1888.

[6] Deut. med. Woch., 1886, No. 21, p. 363. Arch. f. Psychiatrie, vol. ix., pp. 1–45.

[7] Deut. Arch. für klin. Med., vol. xli., p. 458

[8] Berlin. klin. Woch., 1886, No. 40, p. 675.

[9] Progrès médicale, 1876, No. 20. [10] Arch. f. Psychiatrie, vol. xi.

[11] Cited by Gottstein: "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 305. [12] Berlin. klin. Woch., 1886, No. 40, p. 675.

[13] Cited by Gottstein: Op. cit., p. 309. [14] Cited by Gottstein: Op. cit., p. 310.

[15] Cited by Gottstein: Op. cit., p. 319. [16] Birmingham Med. Review, Dec., 1886.

[17] "Hoarseness and Loss of Voice," Amer. ed., Phila., 1869, p. 214.

[18] Op. cit., p. 437.

gests that this fact may act in a causative relation to the disease, apparently abandoning the idea that the disease may be of cerebral origin. Following the same line of argument, Smith[1] explains the increasing dyspnœa, which apparently occurred in his reported case, by the suggestion that the progressive weakening of the posticus muscles resulted in a prolapse, as it were, of the posterior wall of the larynx. It may be interesting to note, in this connection, that Smith's case subsequently suffered an attack of cerebral hemorrhage. Gowers,[2] in an ingenious course of reasoning, points out the fact that the abductor muscles are inserted into the arytenoid cartilages at an acute angle, while in the adductors this insertion is at a right angle. Hence, pressure affecting the nerve trunk results in a paralysis first of the abductors and subsequently of the adductor muscles.

Krause,[3] in his admirable series of articles on this subject, seems to have reached the conclusion that the disease is caused by a spasmodic contraction in the laryngeal muscles. This spasm, furthermore, he states, may result from a morbid condition of the nerve centres, or it may be dependent upon a reflex irritation of the superior laryngeal nerve, or a direct irritation of the recurrent nerve. Krause's experiments on the lower animals repeatedly showed that, whereas section of the recurrent laryngeal gave rise to complete paralysis of the cords in the cadaveric position, pressure on the nerve produced the appearance of abductor paralysis, the cords being brought to the median line and remaining motionless in that position, thus establishing a condition of tonic spasm, an observation, it may be noted, already made by Ley.[4] Wagner,[5] on the other hand, found that after section of the recurrent nerve the cords first assumed the position of abductor paralysis, namely, in the median line, and at a subsequent period only did they assume the cadaveric position. This median position of the cords he attributes to the action of the crico-thyroid muscle. When the superior and median laryngeal nerves were severed, in connection with the recurrent, the cadaveric position of the cords immediately resulted. Krause attributes this median position of the cords in pressure on the nerve, to the spasmodic action of the other muscles in the larynx. The pressure on the nerve, not serving to arrest the nerve current, merely causes an irritation, under which spasmodic contraction follows in the muscles which it supplies. Jellenffy,[6] in

[1] British Med. Journal, July 13th, 1878. [2] Lancet, London, June 5th, 1886, p. 1,077.
[3] Loc. cit. Virchow's Archiv, vol. xcviii., p. 294. Ibid., vol. cii., p. 301.
[4] "Laryngismus Stridulus," 1836, p. 113.
[5] Virchow's Archiv, 1890, vol. cxx., p. 437; and vol. cxxiv., p. 217.
[6] Berl. klin. Woch., 1888, p. 522 *et seq.*

adopting Krause's theory, finds confirmatory evidence of the spasmodic character of the disease in the fact that the voice is not affected. He ascertained that paralysis of the abductor muscles would necessarily result in so great an impairment of tension as to lead to notable vocal weakness. Krause supports his views in an exceedingly able manner, both by shrewd reasoning and close analysis of his cases. That this spasmodic element may be present in some of the rarer and more obscure cases, I have no disposition to question. That it has any bearing, however, on those instances in which the disease has persisted for long periods of time, I do not believe, for it is difficult to understand how a tonic spasm affecting a given group of muscles can persist through a long period of years even, without resulting in degenerative changes which are to an extent uniform in all, for repeated investigations have demonstrated conclusively that the abductor muscles are the ones which alone undergo marked atrophic degeneration. Jellenffy attempts to explain this latter feature of the affection by the fact that the innervation from the respiratory centre, acting upon the abductor muscles, is constant and rhythmic, while that from the phonatory centres, acting upon the other muscles, is periodical. The abductor muscles, therefore, receiving far greater stimulation, thus become more easily the seat of degenerative changes.

This, it seems to me, is pure speculation. The voice, moreover, in abductor paralysis is practically unaffected. It is difficult to believe that this would be possible if the phonatory muscles of the larynx were in a state of tonic spasm.

Second.—As to a morbid condition of the continuity of the nerve as a cause of the disease. Pressure on the recurrent larygneal nerve, or other morbid conditions which may interrupt the nerve current, has been a favorite theory by which the phenomena of abductor paralysis is explained. The advocates of this theory are immediately met with what seems to me an insurmountable objection. In a former article on this subject I made this statement: "As to the suggestion that the disease is due to pressure on the recurrent nerve, and that this pressure so far discriminates between the nerve fibres as to destroy the conductivity of those fibres alone which are distributed to the abductor muscles, it seems to me that the assertion is utterly untenable; that this might happen on one side alone, and that a tumor pressing upon the trunk of the recurrent nerve might so far select its point of pressure as to paralyze the abductor muscles on that side, is among the possibilities; that this should happen on both sides and to both recurrent nerve trunks would be one of the rarest of coincidences; that it should happen in a large series of cases is simply beyond the pale of pos-

sibility." In one of Semon's cases, pressure on the recurrent laryngeal nerves seems to have resulted subsequently in bilateral paralysis of the abductors. Here is a clinical observation which, it would seem, is exceedingly difficult to harmonize with the above assertion. The investigations of Exner and Weinzweig,[1] however, enable us to explain this case of Semon's, which, by the way, I think is quite unique. Both these observers have shown a crossing of the nerves of the larynx, especially of the superior laryngeal, by which the muscles of one side receive innervation from the nerve trunk entering the opposite side, while Mandlestam[2] has demonstrated that some of the fibres of the adductor muscles receive innervation from the superior laryngeal nerve. Ziemssen[3] makes the statement that "paralysis of individual branches of the recurrent nerves may arise from incomplete lesions of the trunk as the result of unequal pressure, or when the nerve fibres are affected in an unequal degree by degenerative changes." Semon,[4] completely indorsing Ziemssen's statement, goes further and asserts "there is a distinct proclivity of the abductor fibres to become affected in such cases either at an earlier period than the adductor fibres or even exclusively." This proclivity theory, so ably advocated by Semon, had already been suggested by Rosenbach,[5] and was based on the observation of a single case, and subsequently sustained at the London Congress.[6]

As I understand this teaching of Semon's, he does not design to convey the idea that the individual muscles may be paralyzed by unequal pressure on the nerve trunk or by differentiated degenerative changes produced therein, but rather that, where the nerve current which supplies all the laryngeal muscles is hampered or interrupted by pressure exerted in the course of the nerve, the fibres which supply the abductor muscles succumb first. In other words, the abductor muscles in this respect are somewhat weaker than the other muscles of the larynx, and thus yield to the influence of a defective innervation, while the stronger muscles maintain their contractility. Semon supports his theory by reporting 8 cases of unilateral and 14 of bilateral abductor paralysis. Of the latter series, the pressure on the recurrent nerve was demonstrated in but 6, while there was serious disease of the brain or spinal column in 6.

I have no desire to ignore the further teaching of the admirable

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[1] Monatschrift für Ohrenheilkunde, Dec., 1884.

[2] Monatschrift für Ohrenheilkunde, Dec., 1884.

[3] Op. cit., vol. vii., p. 948.

[4] Loc. cit.

[5] Breslau Zeitschrift, 1880, Nos. 2 and 3.

[6] Trans. International Med. Congress, London, 1881, vol. iii., p. 222.

series of experiments performed by Semon in connection with Victor Horseley,[1] although I do not think they sustain Semon's proclivity theory. Briefly, these experiments were as follows: The recurrent laryngeal nerve in one of the lower animals was exposed and ligatured. At the end of several days the animal was killed, and an examination showed degeneration of the abductor muscles, with but slight changes in the other muscles supplied by the nerve. In addition to this, another experiment was performed, by which the larynx, with the recurrent nerves attached, was removed from the animal, and the trunk of the recurrent nerve subjected to an electric current, demonstrating that the contraction ceased in the abductor muscles before the others, or, in other words, the abductors died first. The experiments of F. Donaldson, Jr.,[2] in connection with Prof. Martin in the laboratory of the Johns Hopkins University, differed from the above in that they were performed upon a living animal, although subsequently verified on the dead subject. The conclusions were virtually the same, in showing that, as the result of stimulation of the recurrent laryngeal nerve by the electric current, the adductor muscles survived the abductors. The admirble series of experiments made by Hooper,[3] in connection with Professor Bowditch, in the physiological laboratory of Harvard University, in the same line of investigation failed to substantiate the conclusions arrived at by Semon, Horseley, and Donaldson, in that under electrical stimulus the abductor fibres showed an amount of vitality fully equal to the adductors. The fact, however, seems to be established beyond dispute that, under stimulation, the adductor fibres show greater vitality than the abductors, or, in other words, that the abductor fibres show a proclivity, if you like, to paralysis, Hooper's experiments alone failing to establish this view. This greater vitality of the adductor muscles is still further illustrated in those cases of bilateral anchylosis of the crico-arytenoid joint, improperly regarded as cases of bilateral paralysis of the abductor muscles. Thus, in the two cases reported by Lefferts[4] as the result of syphilis, there was apparently bilateral paralysis. It seems to me, however, that a nicer diagnosis would show that the blood poison had given rise to a local anchylosis of the crico-arytenoid joint, with fixation of the cords in the median line, due to the fact that the more powerful structure of the adductor muscles overcame the less resistance on the part of the abductors.

How far these experiments throw light on the causation of

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[1] Brit. Med. Journal, 1886, Aug. 28th and Sept. 4th, pp. 405 and 445.

[2] Trans. of the Amer. Laryngological Ass'n, 1886 and 1887.

[3] Trans. Amer. Laryngological Ass'n, 1885–87.

[4] N. Y. Med. Journal, Dec., 1878.

abductor paralysis, I think still remains an open question. That they prove a difference in the response to electrical stimulation, on the part of the phonatory and respiratory muscles of the larynx, is conceded, and I think we may naturally expect this would be the case. The two functions differ essentially in a very marked degree. The respiratory movements of the larynx are unceasing, commencing with the first breath of life and only ending with dissolution. The phonatory movements of the larynx, on the other hand, are intermittent. The respiratory movements are involuntary, the phonatory movements voluntary. These functions, therefore, necessarily involve certain differences in innervation. I think an analogy may be suggested between the posticus muscles and the cardiac muscles, in that their contraction never ceases during life. May we not venture a further analogy in that, under an electric stimulus, the heart is arrested in diastole, or, in other words, it is for the time paralyzed? Under the electric stimulus, if continued, the abductor muscle is paralyzed. The analogy, of course, is not complete, but a certain similarity in the action of these two muscles, the cardiac and the abductor, under the electric stimulus, is suggested.

After all, it is a question as to how far physiological experiment aids us in the elucidation of the finer points in neuropathology. Can the nice differentiation and delicate localization of a morbid process at the ganglionic centres, or in the continuity of a nerve, be in any way imitated, or even approached, by the harsh, coarse, and rude manipulations of the physiologist's scalpel and scissors? In clinical study, then, and in an analysis of symptoms as they present to us in the cases which come under our observation, I think we must seek for the true cause of these affections; and certainly, if my conclusions shall be correct, we will find a stronger confirmation here in the view that abductor paralysis is due, not to a peripheral lesion or to disease of the nerve trunk, but to

Third.—A morbid condition of the nerve centres.

Mackenzie, in his later work, seems to have abandoned the idea that this disease was due to a central lesion, as suggested in his earlier publication. In my article, already quoted, I wrote as follows: "Reasoning from analogy, considering the peculiar character of the respiratory movements of the larynx in that they are purely involuntary and also reflex, that the opening of the glottis constituting the respiratory movement is an independent action separate from all the other movements which take place in the larynx as the result of muscular contractions, it is fair to conclude that this function is presided over by an independent ganglionic nerve centre, and that the disease in question consists in some

degenerative change taking place in this portion of the nerve centres."

This view, I think, is still further substantiated by a brief review of the clinical history of locomotor ataxia or tabes dorsalis.

Duchenne, Féréol,[1] and Charcot[2] lay especial emphasis on laryngeal crises, or cough and dyspnœa, as not infrequently accompanying the early stages of this disease, although not defining the specific condition observed on laryngeal examination. This point was still further and very fully elaborated by Cherschevsky,[3] who still failed to describe definitely the laryngeal conditions. That the special condition should be so long overlooked is perhaps not remarkable when we consider, as Gottstein[4] suggests, that unilateral paralysis of the abductors may give rise to no special symptoms with reference to the voice.

Krause,[5] in reporting three cases of tabes, gives a definite description of the laryngeal conditions as revealed by examination. In one of these cases there was anæsthesia of the lining membrane of the larynx and loss of reflex irritability. In the other two, reflex was retained. In all these cases the cords were paralyzed in the median line. Krause explains this condition on the theory of spasm. This view, as already stated, I regard as scarcely tenable, the condition being one rather of paralysis of the abductor muscles, as illustrated in the case reported by Ross,[6] in which the characteristic symptoms of tabes were present, and an autopsy revealed degeneration of the medulla in the region of the columns of Goll, in the posterior nuclear zone, and in the cerebellar crura. Wegener[7] is quoted as reporting two cases of his own and making a compilation of other cases of tabes with laryngeal paralysis, in all of which the laryngoscopic lesion was the same, namely, paralysis of the abductor muscles. In a case reported by Semon,[8] of bilateral paralysis of the abductors, the patient developed well-marked symptoms of tabes two years later. Semon takes the ground that there is no necessary connection between the two, and attributes the paralysis to other causes. In the light of later reports this position is hardly tenable, laryngeal paralysis marking more probably the early development of spinal disease. Saundby[9] reports a case of tabes in which there was paralysis of the abductors and paresis of the adductors with abnormal frequency of the heart's action.

[1] Gaz. Hebdomadaire, 1869, No. 7, p. 108.
[2] Progrès médicale, 1879, No. 17, p. 319.
[3] Rév. de Méd., 1881, No. 1.
[4] Op. cit., p. 323.
[5] Berlin. klin. Woch., 1886, No. 20, p. 651.
[6] Brain, London, 1888.
[7] Annual of Universal Med. Sciences, 1888, vol. i., p. 89.
[8] Clinical Society Trans., vol. xi., p. 141.
[9] Birmingham Med. Review, Dec., 1886.

On autopsy, there was degeneration of the posterior fibres of the cord extending into the medulla, involving the posterior pyramids and restiform bodies. The recurrent nerve was in a condition of chronic interstitial neuritis.

Cases of double abductor paralysis, without autopsy, have been observed by Morgan,[1] Lhoste,[2] Eisenlohr,[3] Oppenheim,[4] Ziegelmeyer,[5] McBride,[6] Weil,[7] Landgraf,[8] Krause,[9] Ross,[10] Felici,[11] Luc,[12] Burger,[13] the author,[14] and others.

Although I am not prepared to make the broad statement that all cases of this disease are due to a lesion of the medulla, I think the weight of evidence goes to show that certainly a very large proportion of the cases which we see are of this kind, and this should lead us, certainly in every case where the paralysis involves both sides, to suspect the existence of some morbid process in the bulbar region, the laryngeal paralysis being accepted as evidence of this. That the disease may occur as the result of pressure on both recurrent nerves, I think, probably, must be conceded, in view of the cases reported by Semon and others; but even in these I think it is probable that, if a careful investigation of the bulbar region were obtainable some morbid process would be discovered.

Barling[15] reports a case occurring in a girl nineteen years of age, in which a number of attacks occurred at intervals varying from two to twelve months. In two of these attacks the dyspnœa was of such a character as to demand tracheotomy. The muscles regained their motility after the patient had worn a tube for a short period. The disease seems finally to have disappeared. Barling regarded it as hysterical in its origin. In a case reported by Trevelyan[16] the myopathic character of the attack seems clearly established. The patient was an adult male, and was brought to the hospital with a severe attack of dyspnœa, which had lasted but a few days. The vocal cords were motionless in the median line. Tracheotomy was done, and the tube was removed at the end of ten days, the muscles having regained perfect contractility. A

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[1] Med. Times and Gaz., 1881, vol. ii., p. 362.
[2] Thèse de Paris, 1882, p. 35.
[3] Deut. med. Woch., 1884, p. 554.
[4] Berlin. klin. Woch., 1885, p. 53.
[5] "Bericht über die Sommersaison 1884 im Schwefelbad Langenbrücken," Bruchsal, 1885, p. 15.
[6] Edinburgh Med. Jour., 1885, vol. xxxi., pp. 12 and 15.
[7] Berl. klin. Woch., 1886, p. 197.
[8] Berl. klin. Woch., 1886, p. 634.
[9] Berl. klin. Woch., 1886, p. 744.
[10] Brain, 1886, vol. ix., p. 24.
[11] Arch. Ital. di Laryngol., 1887, vol. vii., pt. 2.
[12] La France méd., 1887, vol. i., p. 174.
[13] "Die laryngealen Störungen der Tabes dorsalis," Leiden, 1891.
[14] Jour. of Nervous and Mental Diseases, New York, January, 1889.
[15] Birmingham Medical Review, 1891, vol. xxx., p. 105.
[16] British Medical Journal, 1890, vol. ii., p. 616.

somewhat similar instance is reported by Glynn,[1] while Sajous[2] reports a case due to lead poisoning.

PATHOLOGY.—The various changes which occur in the nerve centres and in the continuity of the nerve have already been clearly indicated. Perhaps the most interesting feature of the disease lies in the fact that the abductor muscles themselves undergo degenerative changes with atrophy, purely as the result of the interrupted nerve current. These changes are especially noticeable after the paralysis has persisted for a number of months. The first change which is observed in the muscular structure is a cloudiness of the fibres. This is followed by a disappearance of the striation, the breaking down of the sarcous elements, and the final absorption of the granular detritus. In this manner there is left nothing more than the connective-tissue fibres of the sarcolemma. These degenerative changes are completed, probably, in from six to eight months. The teaching of this is that, in a case where the abductor paralysis has existed for this period of time, restoration of motility is scarcely to be regarded as possible.

SYMPTOMATOLOGY.—The prominent feature of the affection consists in a gradually progressive development of inspiratory dyspnœa, which soon assumes a somewhat spasmodic character. These attacks of inspiratory dyspnœa, which at the onset of the affection are somewhat mild in character and give rise to no serious apprehension, gradually assume a more serious form, and, in addition to this, the attacks recur with greater frequency. The inspiratory character of the attacks is well marked from the first; and as the paroxysms assume a more aggravated type, the act of inspiration becomes not only noisy, but exceedingly labored. These paroxysms of dyspnœa, which at first recur at somewhat prolonged intervals, finally are precipitated by any slight excitement or effort, and may come on a number of times during the day. Expiration is in no way affected, and there is, moreover, nothing in the voice which would call attention to the fact that the source of the disease was in the laryngeal cavity. This latter, however, is clearly indicated by the inspiratory character of the dyspnœic attacks. This is due, as we have seen, to the fact that the vocal cords are paralyzed and lie in the median line.

During the intervals of the attacks the patient breathes apparently with perfect ease. This feature of the affection would seem to lend strong support to Krause's theory of spasm. I think, however, that we must concede a certain amount of motility to the abductor muscles during the earlier period of the disease. When,

[1] Lancet, London Sept. 1st, 1877.

[2] Trans. Amer. Laryngol. Ass'n, 1881, p. 151.

however, their activity is completely destroyed, the cords fall so closely into apposition in the median line that the entrance of air into the lungs becomes impossible, and the patient succumbs during a suffocative attack, unless relief has been afforded by the insertion of a tracheotomy tube.

There are certain features in the gross anatomy of the larynx, also, which I think in part explain the dyspnœic attacks. A transverse section of the larynx will show that the upper surfaces of the vocal cords and adjacent tissues are hollowed in such a manner that they present a valve-like orifice, when near approximation, not unlike that of the semi-lunar valves of the aorta. The ingoing current of air thus has a tendency to render their closure more complete when brought near together. This action will be more clearly appreciated by reference to Fig. 84.

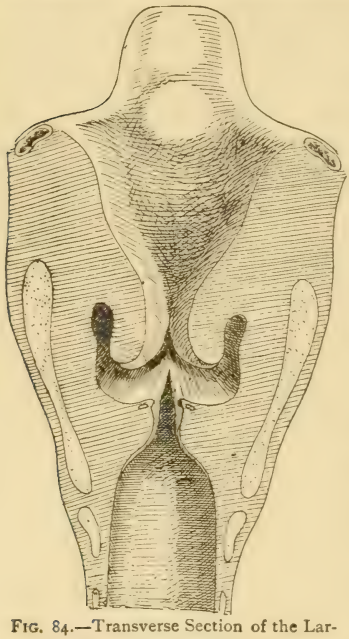

FIG. 84.—Transverse Section of the Larynx, illustrating the Valve-like Action of the Cords in Bilateral Paralysis of the Abductors.

The clinical features of the disease, as far as the larynx is concerned, are confined to the paroxysmal attacks of dyspnœa, and any other symptoms which present are dependent upon the disease which gives rise to the laryngeal paralysis, such as a central nerve lesion, aneurism of the aorta, tumor of the mediastinum, bronchocele, enlarged lymphatic glands, locomotor ataxia, or other lesion involving either the nerve centres or trunk.

DIAGNOSIS.— The recognition of the disease depends upon a laryngoscopic examination, which will show the cords lying practically motionless near the median line. During the act of inspiration, instead of any normal effort at separation of the cords being observed, we find the chink of the glottis narrowed and the cords in a position of parallelism (see Fig. 85), leaving a space of from one-eighth to one-tenth of an inch, while in expiration the rima is opened by the pressure of the outgoing current of air. During phonation, which is accomplished with ease and in the normal manner, the cords are brought into close apposition and vibrate as in health.

I know of no disease which presents a laryngoscopic appearance that can be mistaken for this form of paralysis, unless we except

anchylosis of the crico-arytenoid joints. When this has taken place, the fixed position occurs usually with the cords in the median line, presenting an appearance practically identical with that of abductor paralysis. This form of anchylosis in most instances occurs in connection with some of the graver diseases, such as cancer of the œsophagus, tubercular laryngitis, and in rare instances in syphilis. This median position of the cords developed in a case of cancer of the œsophagus observed by myself,[1] the patient dying from suffocation before tracheotomy was permitted. The cords may assume this median position also in laryngeal phthisis, as in a case reported by Weber.[2] These cases should not be confounded with those of a purely neuropathic character.

The most important part of the diagnosis, of course, lies in the careful investigation of the case to discover, where possible, the direct source of the laryngeal paralysis, whether it be in the medulla or in the course of the nerve, or possibly myopathic in origin, since it is only on such knowledge that any intelligent treatment can be based.

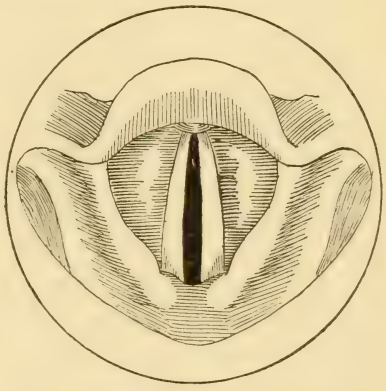

Fig. 85.—Bilateral Paralysis of the Abductor Muscles.

Prognosis. — This is not a disease which in itself ordinarily involves any very great danger to life, although of course in any given case the prognosis will depend largely on the ascertained cause of the affection, as bearing on the danger to life, or the hope of recovery from laryngeal impairment. A number of instances have been reported where death from dyspnœa has occurred; but after the insertion of a tracheotomy tube these patients may live apparently indefinitely. In a somewhat famous case reported by Mackenzie,[3] the patient wore a tube for twenty-four years, and died[4] from concurrent disease. In a number of cases the history records a fatal termination soon after the introduction of the tube, but this has always been from the graver disease which gave rise to the laryngeal paralysis, such as carcinoma, aneurism, etc.

Those cases in which the disease develops rapidly seem to afford the best hope of ultimate recovery. Thus, in a case reported by Rehn[5] the disease developed soon after an attack of typhoid

[1] New York Medical Journal, Nov., 1880, p. 465.
[2] Phila. Med. Times, June 19th, 1880. [3] Op. cit., p. 443.
[4] Personal communication from Dr. Roe.
[5] Deutsches Arch. für klin. Med., vol. xviii.

fever, necessitating tracheotomy. The tube was removed at the end of fifteen weeks, the cure being complete. Blake[1] reports a case in which the cause of the attack was scarlatina. The dyspnœa became so great at the end of ten days as to necessitate tracheotomy. In this case the tube was removed at the end of a week, with perfect recovery. In Glynn's[2] case the disease had persisted for twenty-four days, when the trachea was opened. At the end of two months the tube was removed with safety. On the other hand, in a case observed by Cohen,[3] the disease had existed for two years before tracheotomy was necessary, and in this case the wearing of the tube became a permanent necessity; while in Mackenzie's case, already referred to, the disease had apparently been developing for eight years. In one of my own cases[4] the wearing of a tracheotomy tube was rendered a permanent necessity in an instance in which the disease had been developing for twelve months. On the other hand, Feith[5] reports the case of a woman sixty-eight years of age who, six weeks after an attack of facial erysipelas followed by double pneumonia, was attacked by double abductor paralysis, which at the end of five days demanded the insertion of a tracheal tube, the permanent wearing of which became a necessity.

The clinical teaching would seem to be, as before stated, that, where the abductor muscles have been paralyzed for at least nine months, the degenerative changes have progressed to such an extent as to render a return of motility impossible.

TREATMENT.—If the paralysis is due to pressure on the nerve trunk or to central lesion, any treatment directed to the laryngeal manifestation will only be a waste of time and a needless tax upon the patient. If, however, a careful investigation of the case warrants the opinion that the lesion is peripheral, it becomes our duty to remove any inflammatory or other local condition that may be found in the mucous membrane of the larynx, while at the same time the attempt should be made to restore motility to the paralyzed muscles by the application of the electric current, the administration of strychnia, by massage, and such other measures as may seem indicated. In a case reported by Von Ziemssen,[6] a man aged twenty-six, who had suffered from symptoms of this form of paralysis for seven and a half months, was cured at the end of six weeks by the use of the faradic and galvanic currents applied both externally and internally. Meschede[7] reports a somewhat inter-

[1] Boston Med. and Surg. Jour., Aug. 23d, 1877. [2] Loc. cit.
[3] "Diseases of the Throat and Nasal Passages," 2d ed., p. 654.
[4] Loc. cit., p. 464. [5] Berliner klin. Woch., 1874, No. 49.
[6] Op. cit., vol. vii., p. 963. [7] Berliner klin. Woch., 1878, No. 17.

esting case occurring in a young woman of nineteen, in which the laryngoscope revealed the characteristic appearances of double abductor paralysis. He attributed the disease to hysteria. The fact that the patient was aphonic would throw a shade of suspicion on the diagnosis, although there was notable dypsnœa. The interesting feature of the case was that the symptoms suddenly disappeared for a time upon preparations being made to use the actual cautery. The dyspnœa persisted, however, and only finally yielded to the subcutaneous injection of strychnia. She was cured by a four-months' course of treatment.

No prominent mention has been made of syphilis as a cause of the disease, and yet a number of instances have been observed of this character. In two cases under my own care[1] the laryngeal symptoms had lasted for about a year. In both, tracheotomy was done, and the wearing of the tube became a permanent necessity, internal medication being of no avail. In two cases reported by Lefferts,[2] in one of which the disease had lasted but a few days, while in the other it had existed mildly for six months and severely for seven, complete cure was effected by the internal administration of iodide of potassium. In a case reported by Knight[3] the disease seems to have persisted about seven months before tracheotomy was done, after which the tube was worn permanently. Robinson[4] and Whipham[5] report instances of the disease, which in the former had lasted two years and in the latter three months, in which internal medication failed entirely to restore motility to the muscles, although the symptoms were not sufficiently urgent to demand tracheotomy. A case reported by Smith[6] is somewhat instructive, in that tracheotomy having been done after the disease had existed for two years, the motility of the muscles seemed to be completely restored at the end of four months by the internal use of the iodides, together with local faradization, and the tube was removed. Six weeks later the dyspnœa returned, and the patient died from suffocation before the tracheal tube could be reinserted. Other instances of a syphilitic origin of the disease have been observed by Penzoldt,[7] Hayes,[8] Hughlings Jackson,[9] and Mackenzie.[10]

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[1] N. Y. Med. Jour., November, 1880, p. 464.
[2] N. Y. Med. Jour., December, 1878.
[3] Boston Med. and Surg. Jour., August 23d, 1877.
[4] Amer. Jour. Med. Sciences, April, 1878.
[5] St. George's Hosp. Reports, 1878.
[6] Amer. Jour. Med. Sciences, January, 1878.
[7] Deut. Arch. für klin. Med., 1874, vol. xiii., p. 107.
[8] Dublin Jour. Med. Sciences, January, 1880.
[9] Med. Times and Gaz., December 15th, 1866.
[10] "Diseases of the Throat and Nose," Amer. ed. vol. i., p. 443.

The indications for treatment, of course, in a case where its syphilitic origin can be determined, seem perfectly clear in the administration of full doses of iodide of potassium. In addition to this, there can be no question as to the advisability of subjecting the paralyzed muscles to the action of either the faradic or galvanic current, according to the reaction which is obtained by experimental test.

As before suggested, it is doubtful if motility can be restored to a muscle after the paralysis has existed for a period longer than nine months; and yet in no instance, I think, should the attempt be omitted while there seems any hope whatever of eliminating the cause of the affection, whether it be a central lesion or pressure on the nerve trunk. In Smith's case, as we have seen, the muscular contractility seems to have been completely restored, for the time, after the paralysis had existed two years.

If in any given case the remedial measures which are instituted are not immediately followed by an amelioration of the condition, as shown by an increased separation of the cords in inspiration, there can be no question as to the propriety of tracheotomy. It is certainly not wise in these cases to defer the operation until the dyspnœic symptoms render it absolutely inperative. The number of cases which have perished from suffocation clearly show that a fatal paroxysm is liable to occur at any time; furthermore, this may happen when the immediately preceding symptoms have not been especially urgent. Another point which argues in favor of an early tracheotomy is the fact that, after the laryngeal muscles are put at rest by a tracheal opening, we can hope for far better results from internal medication and local electrization than while the patient is suffering from the recurrent dyspnœic paroxysms. This may be due to the improvement in the general health which follows the removal of the obstacle to free respiration, or it may perhaps result from the condition of absolute rest in which the overtaxed muscles are placed.

The point of insertion of the tube is not a matter of any great moment, although in most instances probably it will be better to open the trachea below the thyroid isthmus.

Krause,[1] regarding the disease as of spasmodic origin, as we have seen, suggests the propriety of dividing the recurrent laryngeal nerve on both sides. The result of this would be to throw each cord into the cadaveric position. The dyspnœic attacks would certainly be relieved, but the voice would be lost, and the patient, in conversing in a whisper, would be subjected to that curious and exhausting phonative waste which is characteristic of this position of the cords.

[1] Loc. cit.

Unilateral Paralysis of the Abductors.

This form of paralysis differs in no essential degree from the bilateral form already discussed, except that it involves but one side of the larynx and therefore gives rise to a somewhat different train of symptoms. As in the former disease, I believe that in most instances it is due to a lesion of the nerve centres, as in the cases reported by Gerhardt,[1] Semon,[2] Lennox Browne,[3] Nothnagel,[4] Martius,[5] Delavan,[6] Wright,[7] and the author.[8]

The method by which pressure on the trunk of the recurrent nerve may produce a simple paralysis of abduction, without involving the other muscles supplied by this nerve, has been fully discussed in the previous section.

Instances in which this lesion resulted from pressure on the nerve trunk have been reported by Saundby,[9] Gerhardt,[10] Mackenzie,[11] and Semon.[12]

In rare cases the disease may be the result of peripheral conditions, such as acute inflammatory or other processes in the laryngeal cavity. Among other possible causes may be enumerated gout, rheumatism, lead poisoning, typhoid fever, diphtheria, and the other exanthemata.

The condition is easily recognized on laryngoscopic inspection. During phonation the laryngoscopic image differs in no degree from the normal, the cords being perfectly approximated in the median line. During inspiration, however, the cord of the affected side remains motionless, while its fellow is abducted in its normal arc. The only form of paralysis with which it can be confounded is that of the recurrent nerve involving one side, in which the cord assumes the cadaveric position. In the latter disease the cords are approximated, but the chink of the glottis runs in an oblique direction from before backward, while at the same time the arytenoid cartilage of the movable side is brought in front of its fellow. In the disease under consideration, the chink of the glottis during phonation is in perfect alignment from before backward.

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[1] Virchow's Archiv, vol. xxvii., p. 307, case 10; p. 309, case 12.

[2] Arch. of Laryngol., New York, 1881, vol. ii., p. 212.

[3] Med. Press and Circular, 1890, n. s., vol. ii., p. 627.

[4] Wien. med. Blätt., 1884, No. 9. [5] Charité-Annalen, 1889, vol. xiv., p. 315.

[6] N. Y. Med. Record, February 14th, 1885, p. 178.

[7] N. Y. Med. Jour., 1889, vol. l., p. 345.

[8] Trans. Amer. Laryng. Ass'n, 1890, p. 69. Jour. of Nervous and Mental Diseases, January, 1889.

[9] Lancet, London, 1887, vol. ii., p. 898. [10] Loc. cit., p. 310, case 13.

[11] "Hoarseness and Loss of Voice," Am. ed., Phil., 1869, pp. 224, 227, cases 38, 39.

[12] Loc. cit., p. 212, cases 7 and 8.

There are practically no symptoms directly referable to the laryngeal condition. The voice is perhaps somewhat impaired in its higher powers, but ordinary conversation is carried on with perfect ease and good tone. In my own experience, certainly, many of these cases have been discovered accidentally, the patients being unconscious of any vocal impairment or symptoms referable to the throat. In a case which occurred in my own practice some years since, at the commencement of the attack the patient's voice assumed a curious piping falsetto tone, which persisted for about a week, when the voice became natural. This patient died three months later, from a cerebral tumor. I attributed the falsetto voice to a disturbance of co-ordination. As soon as this patient had adjusted his laryngeal muscles to the new condition, he was able to manage them properly, and talked in the natural tone of voice. The abductor paralysis, of course, persisted until death.

In a number of cases reported, dyspnœic symptoms have been present; they are never paroxysmal in character, but constitute simply a shortness of breath on exertion. This probably is the result of the disease which causes the paralysis, such as a bronchocele, an aneurism, or other tumor pressing on the nerve trunk.

In a case of this form of paralysis reported by Martius[1] the cord subsequently assumed the cadaveric position, an observation which is somewhat unique.

To what extent a unilateral abductor paralysis is to be regarded as the precursor of the bilateral form, it is perhaps not easy to determine when we consider how insidiously the former develops, giving rise in many cases to no symptoms which call direct attention to the larynx. The possibility of this danger, certainly, is to be borne in mind. Oppenheim[2] reports a case of complete abductor paralysis of one side, with a paretic condition of the opposite cord. A month later, both cords were motionless in the median line. Marini[3] cites two somewhat similar cases. It should be stated, however, that these were all instances of tabes dorsalis.

The indications for treatment of this form of the disease are practically the same as those already discussed in connection with the double abductor paralysis, with the exception, of course, that tracheotomy for the relief of dyspnœa is never demanded.

Paralysis of Individual Muscles.

Under this group we consider those instances in which impairment of motility is observed in the various other muscles of the

[1] Berliner klin. Woch., 1889, p. 384. [2] Arch. für Psych., 1889, vol. xx., p. 131.
[3] Ibid., 1890, vol. xxi., p. 156.

larynx not already considered, and in which the lesion is the result purely of myopathic causes.

I do not think these cases occur by any means as frequently as is generally supposed, nor do I think they possess any very great clinical interest, with the exception perhaps of paralysis of the arytenoideus muscle. In the very large majority of instances they result from local inflammatory processes, either of an acute or chronic character, invading the mucous membrane of the larynx. In other cases they may be dependent upon over-use or straining the voice. Where met with in cases of syphilis and tuberculosis and other grave lesions of the larynx, they are to be regarded as purely adventitious in character, and as constituting secondary and unimportant lesions of the graver disease.

The exciting cause of the affection is to be found in some local lesion. When it occurs in connection with anæmia, malaria, gout, or rheumatism, on the latter of which especial emphasis is laid by Gerhardt,[1] the laryngeal lesion is due, I think, to the fact that the muscles are weakened by some local inflammatory process set up by the general condition, under the influence of which muscular contractility is destroyed by some over-use or strain of the voice. Those cases which are due to hysteria will be considered later on under the term "hysterical aphonia," this latter constituting a paretic rather than paralytic condition, and, moreover, is due to absence of volitional effort, rather than to any local lesion in the muscle.

The causation of all these so-called myopathic paralyses is probably the same; the other features of the affection require separate consideration.

Unilateral Adductor Paralysis.—I have never seen a case in which I felt warranted in making a diagnosis of this form of paralysis. Cohen[2] reports the instance of a man aged thirty-three, who cut his throat, with suicidal intent. When seen five months later, the vocal band was in a state of extreme abduction. During attempts at phonation, the cord of the opposite side could not be made to approach it sufficiently for phonative purposes. A somewhat similar condition is reported in a case observed by Symonds,[3] in which there was present marked cerebral symptoms, indicating either disseminated sclerosis or general paresis. The diagnosis in both these cases was adductor paralysis. I have no disposition to question this, and yet I fully agree with Lefferts[4] in the assertion that it requires an exceedingly expert eye to draw a distinction between the position of the cord in extreme abduction and

[1] Loc. cit. [2] Trans. of the Amer. Laryngol. Ass'n, 1884, p. 57.
[3] Trans. of the Clinical Soc. of London, 1890, vol. xxiii., p. 273.
[4] Trans. of the Amer. Laryngol. Ass'n, 1884, p. 59.

the cadaveric position. Certainly in Symonds' case the ready suggestion comes that the laryngeal paralysis involved all the muscles in the domain of the recurrent nerve.

That this condition may occur as the result of injury of the pneumogastric, as seems suggested by Cohen,[1] I cannot accept, nor do I believe that paralysis of this muscle can occur from any known lesion of the central or peripheral nervous apparatus. In the nature of the case, it must be purely of a myopathic character. A number of instances of the latter form have been observed by Mackenzie,[2] in which the disease was due to lead poisoning, diphtheria, exposure to cold, etc.

The only symptoms which are the direct result of the laryngeal lesion are either impairment or complete loss of voice, in consequence of the imperfect approximation of the cords.

The diagnosis is based on laryngeal examination, which will show one or the ether cord lying motionless in a position of extreme abduction. During phonation, the cord of the opposite side is brought around as far as possible toward its motionless fellow, its arytenoid thus coming more or less completely in front of the other. The only condition with which it may be confused is that of recurrent laryngeal paralysis, in which the cords assume the cadaveric position. To differentiate between the two is an exceedingly nice point in laryngoscopy. The extremest point to which the vocal cord can be abducted during life is practically very little beyond that position which we recognize as the cadaveric. Certain contributive evidences will be afforded by the condition of the tensor muscles, which of course are not affected in simple abductor paralysis.

Bilateral Adductor Paralysis.—I know of no cases of this form of the disease, other than the five reported by Mackenzie.[3] A careful reading of them, however, would seem to show that in each instance there was noticeable movement in both cords, which would indicate the affection to have been hysterical in character, and hence not one of true paralysis. That a genuine myopathic paralysis involving the lateral crico-arytenoid muscles might occur, as the result of exposure to cold, lead poisoning, diphtheria, scarlet fever, or some other of the exanthemata is among the possibilities. The symptoms to which it would give rise are complete loss of voice, with phonatory waste, as already described in the discussion on double recurrent laryngeal paralysis, from which disease I know of no method of distinguishing it by laryngoscopic examination.

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[1] Loc. cit.

[2] "Hoarseness and Loss of Voice," Amer. ed., Phila., 1869, p. 207 *et seq.*

[3] Op. cit., p. 193 *et seq.*

Paralysis of the Internal Tensors.—This is by far the most common and most easily recognized of all forms of myopathic paralysis, and is the result of an impairment of contractility in the thyro-arytenoideus muscle, which, lying as it does immediately beneath the mucous membrane on the under surface of the cords, thus becomes liable to involvement in such morbid processes of an inflammatory character as invade this region. In this way it occurs commonly in connection with chronic laryngitis, although I think the direct exciting cause in most instances is the result of over-strain or prolonged use of the voice, especially when already weakened by some catarrhal process.

The symptoms to which it gives rise are practically confined to phonation. The voice is not only weakened, but its range materially diminished, the impairment being more marked in the use of the higher notes. The ordinary conversational voice may not be impaired, although, if the muscular weakness is marked, these tones are lowered and approach somewhat in character to the whispered voice.

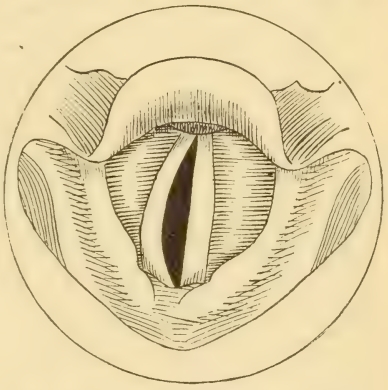

Fig. 86.—Paralysis of Left Internal Tensor.

In most instances the affection is bilateral, although it may be confined to a single cord.

It is easily recognizable on laryngoscopic inspection. During phonation, the rima, instead of presenting the narrow, straight chink as in life, presents an elliptical opening. This is not the effect of a lateral separation of the cords, but is due to the fact that, in forcing the current of air through the chink, the cords belly upward in such a way as to present the appearance of an elliptical opening; indeed the disease is sometimes designated as elliptical paralysis. This ellipse, morever, involves the whole length of the cord, from the thyroid angle to the arytenoid commissure. If the paralysis confines itself to one side, it gives rise to practically the same train of symptoms with reference to the voice, and is easily recognized by laryngoscopic examination, in that, whereas the normal cord presents itself in a perfectly straight line, on the opposite side the bellying out is observed during phonation, in such a way that the glottic opening presents a semi-ellipse (see Fig. 86). Paralysis of the crico-thyroid muscle, as we have seen, gives rise to impairment of phonation and an elliptical or semi-elliptical glottis; but in this case the ellipse extends only from the receding angle of the thyroid cartil-

age to the vocal process. Moreover, the vocal cord, as we know, is practically a tendon of the thyro-arytenoideus muscle. If this latter is paralyzed, the vocal band assumes a narrowed and cord-like appearance; whereas if it is intact, it presents a somewhat broad and flat upper surface, even where the tensor action of the crico-thyroid is ablated.

Paralysis of the Arytenoideus.—This muscle is especially liable to become involved in chronic catarrhal processes in the larynx, of long standing, although Poyet[1] has observed an instance in which it occurred as early as nine years of age. In three cases observed by Proust,[2] one was due to incipient phthisis, one to catarrhal laryngitis, and one to hysteria, while diphtheria was the source of the affection in a case reported by Johnson.[3] The development of the disease in incipient phthisis is further illustrated by cases observed by Duranty[4] and Lermoyez;[5] while hysteria was the assigned cause of the disease in cases observed by Mackenzie,[6] Luaga,[7] and Ducau,[8] Von Ziemssen[9] has observed a case which followed directly upon a severe exposure. The direct result of paralysis of this muscle is the imperfect approximation of the arytenoids for phonative purposes. The voice, therefore, becomes very seriously impaired, or even completely lost, from the fact that during the attempt at phonation only that portion of the glottis is closed which extends from the thyroid angle to the vocal processes, while behind these points a somewhat wide triangular opening is left, as seen in Fig. 87. The voice is either hoarse or completely lost, while at the same time there is a certain amount of phonatory waste, the air escaping through this triangular opening, during the attempt at phonation, to such an extent that conversation becomes fatiguing, and a frequent recovery of the breath becomes necessary.

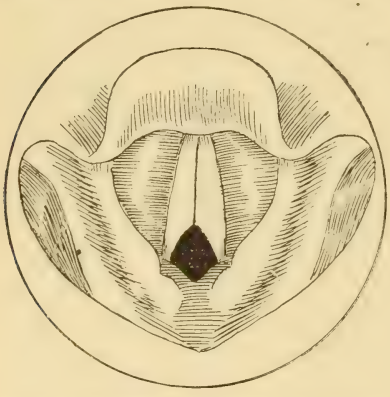

FIG. 87.—Paralysis of the Arytenoideus Muscle.

Laryngoscopic examination clearly indicates the condition, the

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[1] Thèse de Paris, 1877, No. 45, p. 5.
[2] Annal. des Mal. de l'Oreille, 1890, vol. xvi., p. 289.
[3] New York Med. Jour., 1885, vol. xlii., p. 537.
[4] Cited by Martel: Annal. des Mal. l'Oreille, 1879, vol. v., p. 202.
[5] Ibid., vol. xi., p. 147.
[6] "Diseases of the Throat and Nose," Amer. ed., Phila., 1880, vol. i., p. 455.
[7] Revue mens. de Laryngol., 1883, vol. iii., p. 105. [8] Ibid., vol. i, p. 247.
[9] "Cyclop. of the Practice of Med.," Amer. ed., vol. vii., p. 973.

rima being practically normal in its anterior two-thirds, while the posterior third is found widely apart, as in the illustration.

As we have already seen, this condition may occur as the result of a bilateral paralysis of the superior laryngeal nerve, but in the latter case there is also a paralysis of the crico-thyroid muscles, by which the glottis presents an elliptical opening extending from the vocal processes to the thyroid angle.

PROGNOSIS IN MYOPATHIC PARALYSIS.—The only gravity which attends a paralysis of any of the individual muscles of the larynx confines itself entirely to the question of restoration of voice. The longer the disease has existed, the less hope there is of complete recovery. Mackenzie's case of arytenoid paralysis was under observation for twelve years without the slightest amelioration, and yet the paralysis had existed for but two when first seen. On the other hand, where the disease depends upon some simple exposure or is the sequel of diphtheria or one of the exanthems, the tendency is toward spontaneous recovery without treatment other than simple rest to the parts. Paralysis of the internal tensors is perhaps the most obstinate of all these affections, in that the absolute rest which is demanded is exceedingly difficult to enforce. In most instances, probably, the hope of recovery will depend somewhat on the success of treatment directed to the removal of such local lesions as may stand in a causative relation to the muscular impairment.

If a myopathic paralysis develops in connection with incipient phthisis, a natural suspicion would be excited of the presence of some tubercular process in the organ, which, of course, would render the prognosis unfavorable. It is to be remembered, however, that the simple anæmia or impaired general nutrition which accompanies this disease may predispose to the paralysis, in which case there is no reason why it should not be overcome by proper measures.

TREATMENT.—The first indication is in the removal of such local lesion as may exist in the larynx, while at the same time such absolute rest of the parts is secured as may be possible. All prolonged or loud use of the voice is to be absolutely forbidden, and it may be well even to direct the patient for a while to carry on all conversation in the whispered voice. This is especially to be enjoined in the case of singers or those to whom the perfect preservation of the vocal organs is a matter of especial moment.

For the restoration of the impaired muscle, we possess no remedy which will give better results than the application of the electric current. In most instances, probably, the faradic current will afford the best results, although, if any given case fails to respond promptly to this, trial should be made of the continuous current. The applications should be made directly through the paralyzed

muscle, as far as possible. Ziemssen[1] has devised a special set of electrodes which answer an excellent purpose in these cases. In the single instrument one electrode is introduced into the larynx, while the other pole is applied directly over the larynx externally; the double electrode is devised for more direct application of the current to the muscle within the laryngeal cavity. These applications should be made every day, the sittings lasting from ten to fifteen minutes until a notable result is obtained, when the intervals may be prolonged.

This treatment is undoubtedly much aided by the internal administration of strychnia, while special attention should be directed to the general health, and iron and general tonics administered according to indications. Outdoor life, with a sufficient amount of exercise and, if tolerated, the daily use of the cold bath with friction to the skin, should be enjoined, together with such other general hygienic measures as may seem wise.

Hysterical Aphonia.

This term is used to designate a form of aphonia which we occasionally meet with, which is characterized by a complete loss of voice, and in which there is deficient muscular action, due to no pathological lesion, but which is purely functional in character. It is sometimes designated as hysterical paralysis of the vocal cords, and again as functional paralysis. The idea that this is a sham paralysis, or that it arises in any attempt to deceive, should not be entertained; and yet there is no genuine paralysis, no pathological condition, no loss of contractility in the muscular structures, and no loss of conducting power in the nerves. The true nature of hysteria I do not propose to discuss, or the character of the numberless phases which it assumes, but simply to asseverate that, as far as the patient is concerned, hysterical paralysis is a true paralysis for which the sufferer is not directly responsible, and that, whereas it has the appearance of being a counterfeit, the patient cannot control it. The important point, and the one to be emphasized, in the consideration of this affection is that, while the condition is one that can always be assumed under voluntary effort, it is still one which is assumed by the patient under the influence of this strange psychical condition, or by whatever other term we may choose to designate it, and not one which the patient wilfully assumes with the desire to deceive or excite sympathy.

Furthermore, hysterical aphonia or paralysis never counterfeits any of those forms of paralysis which cannot be assumed by volun-

[1] Op. cit., p. 978.

tary effort. The respiratory movements of the vocal cords are involuntary, while the movements of phonation are voluntary. Abduction of the cords being purely an involuntary motion, and occurring only during the act of inspiration, and never as a purely voluntary act, paralysis of the abductors is not met with as a functional or hysterical paralysis.

Again, both the phonative and respiratory movements in the larynx are symmetrical; hence, whether the act be voluntary or involuntary, a unilateral paralysis of the vocal cords can never occur as a hysterical or functional affection. The form which the disease under consideration assumes is that of imperfect approximation of the cords, resembling somewhat the condition which we meet with in double paralysis of the recurrent nerve. The patient does not bring the vocal cords into sufficiently close approximation for phonation; she does, however, adduct the cords somewhat, and the sound produced by the passage of air through the partially closed rima glottidis is transformed into articulate speech by the lips and tongue, etc. The voice is lost, and the patient simply communicates in a whisper. The affections which the disease under consideration may simulate are subacute or chronic laryngitis, those cases of aphonia which are due to mechanical interference with the proper closure of the cords by thickening over the arytenoid cartilages or commissure, and bilateral paralysis of the recurrent laryngeal nerves. Subacute or acute laryngeal catarrh is often accompanied by complete loss of voice; but the laryngeal examination will reveal the normal mobility of the cords, and, in addition, the source of the aphonia in the catarrhal inflammation of the mucous membrane lining the larynx, accompanied by swelling of the membrane covering the cords, which has resulted in loss of voice simply from the thickened condition of the cords. If the mucous membrane covering the arytenoids or the commissure is so far swollen or infiltrated as to offer a mechanical obstacle to the proper closure of the cords, this will be easily recognized. In double paralysis of the recurrent laryngeal nerves, all the muscles of the larynx are completely paralyzed, the cords are absolutely motionless and in a position midway between extreme adduction and abduction, namely, in the so-called cadaveric position. This position of the vocal cords cannot be assumed or simulated, for, while under voluntary effort the cords may be partially approximated and brought into the same position of half-way approximation, or into the cadaveric position, the instant that inspiration occurs the glottis will be widened under the involuntary movement which always attends the inspiratory act, and movement can be seen to take place. This is the characteristic condition which we meet with in hysterical or func-

tional paralysis; it is always a bilateral affection, and always assumes the form of incomplete closure of the glottis. It may not improperly be designated as bilateral paresis of the adductor muscles, only that this would involve the idea of some genuine lesion of the nerve trunk or the muscular structures which, as before stated, does not exist. Meschede[1] has reported a case of hysterical or functional paralysis of the abductor muscles, in which the paralysis seemed complete, producing that very grave condition described under the head of Bilateral Paralysis of the Abductors. The apparent dyspnœa was so great that preparations were made to perform tracheotomy, when, according to the account, the patient suddenly spoke, and the condition disappeared.

That hysterical paralysis may assume the character of this serious affection is undoubted, as any one can demonstrate on his own person by imitating an inspiratory dyspnœa, closing the glottis, and, attempting to inspire, producing a noisy, stridulous inspiration: but that this can be kept up for any length of time is questionable. In Meschede's case, however, there was a false color in the picture, in that there was aphonia in connection with the paralysis of abduction, and this, as we know, does not occur in the disease referred to, the voice being usually nearly normal. A careful study of the larynx will serve to clear up the diagnosis of these cases, and enable the physician to determine with a considerable degree of certainty that the aphonia is a functional disorder, and not due to any pathological lesion, simply by exclusion; for, as a rule, the laryngeal image does not and will not present a complete picture of any of the forms of genuine paralysis. In addition to this, there will be the usual accompanying general evidences of the hysterical temperament, which we all recognize and which it is not necessary to describe here. It should be added also that cough is present in hysterical aphonia, while in genuine paralysis of the adductors it is entirely lost; the possibility of a cough being dependent on the ability to close the glottis, whether this closure be by voluntary or involuntary muscular effort. Furthermore, the onset of this form of laryngeal paralysis is quite sudden. It comes on without any previous warning whatever, and with no symptoms which have in any way called attention to the larynx. Ordinarily a patient awakens in the morning and discovers that she cannot talk. The crucial test, and one which can be relied on with great certainty for diagnostic purposes, is the administration of an anæsthetic. Where there is any doubt as to diagnosis, ether should be given, when, as a rule, it will be found that during the second stage of anæsthesia, namely, that of excitement, the patient will break

[1] Berliner klin. Woch., 1878, No. 17.

into a very satisfactory use of the voice. It is unnecessary to say that the victims of this disorder are women from fifteen to forty-five years of age, and most frequently unmarried, or those in whom the sexual life has been perverted.

TREATMENT.—The judicious management of a case of hysterical aphonia, as that of any other form of hysteria, requires far less special skill than good sense. It is utterly unsafe to treat these cases as unreal or as dishonest. As far as the patient is concerned, the paralysis is a genuine paralysis, as much so as if the trunk of the nerve were destroyed; and the recognition of this fact is of the utmost importance in the successful management of the case. Hence, within bounds it is not only justifiable, but even necessary, to treat it as a real paralysis. In addition, therefore, to the removal of any exciting causes, such as uterine disease, etc., resort should be had to local treatment; the end in view is to convince the patient that she can use her voice. It is not always an easy matter to do this without resorting to some method of removing the morbid condition which she believes to exist. Hence, one way of accomplishing this is by resort to local measures of treatment, securing the patient's confidence and assuring her that such and such measures will be attended with success, and that at some designated time the complete restoration of the voice will be effected. In Meschede's case, previously alluded to, a profound impression was made on the patient by the preparations for tracheotomy, with the result of completely removing the paralysis. This procedure may be successfully imitated in any manner which the ingenuity of the physician may devise.

SPASM OF THE GLOTTIS.

By this term we designate that sudden closure of the aperture of the larynx as the result of which the entrance of air is more or less completely shut off during the persistence of the attack. We thus restrict the term to those cases which are purely neurotic in character, excluding the mild paroxysm of dyspnœa which occurs in catarrhal affections of the larynx—the so-called cases of laryngismus stridulus, to which reference has already been made in the chapter on Subglottic Laryngitis. The spasm which results from the presence of a foreign body in the larynx is also sufficiently discussed in another chapter.

We find vague references to glottic spasm scattered throughout early medical writings from the time of Hippocrates, in which the neurotic and asthmatic character of the disease seems to have been recognized. It remained, however, for Simpson,[1] in the latter part

[1] "Dissertatio de Asthmate infantum spasmodico," Edinburgh, 1761.

of the eighteenth century, to give us a somewhat definite clinical description of the affection, in which, however, he included many of the catarrhal affections of the air tract which were attended with suffocative attacks. Still later, Millar[1] emphasized Simpson's teaching in a somewhat elaborate treatise, as the result of which the disease was for many years designated as Millar's asthma. The tendency of subsequent writers, such as Wichman, Hamilton,[2] Clark,[3] and others, seems to have been to eliminate the inflammatory element in the malady, and regard it as largely neurotic, until Kopp[4] published his famous treatise in which he contended that the disease was due to pressure exercised by hypertrophy of the thymus gland: from which the disease was for some time designated by many writers as thymic asthma. In 1836 Ley[5] published a notable essay on the subject, in which he advanced the novel theory that the affection was not spasmodic in character, but was rather due to a paralysis of the abductor muscles as the result of pressure upon the recurrent nerve by enlarged bronchial or cervical glands. In 1841 appeared Marshall Hall's great work on the nervous system,[6] in which the ground was taken that all cases of laryngeal spasm were due to reflex disturbances, while a few years later Elsässer[7] seems first to have suggested a central origin of the affection, attributing it to a softening of the occipital bones with a resultant pressure on the brain tissue. Among the subsequent notable contributors to our knowledge of the subject should be especially mentioned Steffen,[8] Flesch,[9] Barthez and Rilliet,[10] Bouchut,[11] West,[12] Henoch,[13] Gerhardt,[14] D'Espine et Picot,[15] and Shattuck,[16]. The later writers seem to be divided somewhat between the teaching that the disease is due to central origin or involvement of the motor nerves of the larynx, and the view that it is reflex in character.

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[1] "Observation on the Asthma and the Whooping-Cough," 1769.
[2] "Diseases of Infants and Children," 1813.
[3] "Diseases of Children," 1815.
[4] "Denkwürdigkeiten in der ärztlichen Praxis," Frankfurt, 1830.
[5] "Essay on Laryngismus Stridulus," London, 1836.
[6] "The Nervous System," 1841.
[7] "Der weiche Hinterkopf," Stuttgart, 1843.
[8] Ziemssen's "Cyclop.," Amer. ed., vol. vii., p. 989.
[9] Gerhardt's "Handbuch der Kinderkrankheiten," vol. iii., pt. 2.
[10] "Traité des Mal. des Infants," Paris, 1853, vol. ii.
[11] "Traité pratique des Nouveau-nés," Paris, 1862, p. 91.
[12] "Diseases of Infancy and Childhood," 1865, p. 187.
[13] Berliner klin. Woch., 1867, No. 19.
[14] "Lehrbuch der Kinderkrankheiten," 1871, p. 285.
[15] "Mal. de l'Enfance," Paris, 1884.
[16] Boston Med. and Surg. Jour., 1886, vol. cxiv., p. 1.

While the source of the disease, of course, is to be sought in some disturbance of the nervous system, it is a mistake to suppose that all cases can be assigned to any one lesion. The clinical history of this disease presents such distinct features, as occurring in infancy on the one hand and in adult life on the other, that it seems wise to consider it under two distinct headings.

Spasm of the Glottis in Children.

It is exceedingly difficult to derive much information on this subject from the earlier literature, since, as before intimated, most writers confuse the paroxysms of dyspnœa which occur in catarrhal inflammation with those which are purely neurotic in character, grouping all under the same heading. The laryngeal spasm which occurs in laryngismus stridulus or subglottic laryngitis has already been discussed. Moreover, our present consideration is confined to those cases in which the disease is purely neurotic in origin.

That a neuropathic laryngeal spasm should occur in children, and that it should also be more common than in adult life, is quite as easy to understand as that eclampsia or general convulsions should be a disease of early life.

Etiology.—As a matter of clinical observation, the most common cause of the disease seems to be rachitis. Whether this is due to pressure as the result of rachitic softening in the occiput, as suggested by Elsässer,[1] or whether it is the consequence of impaired nutrition, it is difficult to state, although more probably the latter is the correct view. In the same way it is liable to occur in children whose health is undermined by improper food, bad hygienic surroundings, insufficient clothing, and other circumstances of this kind. With these predisposing causes, the attack is liable to be excited by prolonged crying, exposure to cold, an attack of whooping-cough, dentition, gastric or intestinal disturbances such as the presence of undigested food, or parasites, and indeed any condition which is liable to excite reflex disturbances in young children, as well as any local condition in the upper air passages which is attended by increased sensitiveness of the laryngeal cavity. That pressure on the laryngeal nerves, from enlarged bronchial or tracheal glands or any other cause, may give rise to the disease, cannot be questioned. This pressure may be exerted by an enlarged thymus gland, on which, as we have seen, Kopp based his hypothesis of thymic asthma. That this is but a rare cause of the disease has been conclusively demonstrated by the investigations of Bednar,[2]

[1] "Der weiche Hinterkopf," 1843, p. 161.

[2] "Krankheiten der Neugebornen," 1852, vol. iii., p. 81.

Hérard,[1] and Friedleben.[2] Gerhardt[3] has observed instances in children of the same family, while Reid[4] reports a family of thirteen children, twelve of which suffered from this affection. A number of similar observations have been made, which would seem to indicate the hereditary character of the affection, although a more probable explanation of these cases is that a certain diathetic condition is inherited which predisposes to the disease.

It belongs essentially to the earlier period of childhood. According to Friedrich,[5] it occurs between the ages of four and fourteen months. Rilliet and Barthez[6] have observed it usually between the ages of one and eighteen months. Wunderlich,[7] dividing the disease into two varieties, acute and chronic, states that the acute form occurs between the ages of one and nine, while the chronic form is met with at from four to ten months. This writer's acute cases are presumably instances of subglottic laryngitis or catarrhal croup, which, as before stated, is probably to be regarded as one of the manifestations of lymphatism. The observations of Steiner,[8] Henoch[9] and others do not differ from the above, except in the assertion that the disease may occur as late as the second or even the third year of life. In most instances, however, it is met with between the first and the eighteenth month.

As regards sex, all agree that it is much more common among males than females. In a compilation of 544 cases made by Steffen,[10] 386 were boys and 158 girls.

PATHOLOGY.— The paroxysm is the result of a spasmodic contraction of those muscles of the larynx whose normal function is to close the glottis. These are the thyro-arytenoids, the lateral crico-arytenoids, and the arytenoideus. This glottic closure may also occur as the result of paralysis of the posterior crico-arytenoid muscles, and Wunderlich[11] was of the opinion that this was the cause of the disease under consideration, sustaining this view by the observations of Ley,[12] who had shown that spasm of the glottis was excited by the including of the recurrent nerve in a ligature. Basing his conclusions on a similar observation, as we have seen, Krause entertains the opinion that that curious disease in adult life usually

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[1] Thèse de Paris, 1847.
[2] "Die Physiologie der Thymus-Drüse," Frankfort, 1858.
[3] "Lehrbuch der Kinderkrankheiten," 1871, p. 285.
[4] Lancet, London, May, 1875.
[5] Virchow's "Handb. der spec. Path. und Ther.," vol. ii., p. 501.
[6] Loc. cit. [7] "Handb. der spec. Path. und Ther.," vol. iii., p. 1.
[8] "Compend. der Kinderkrankheiten," 1873, p. 139.
[9] "Beiträge zur Kinderheilk.," n. s., 1878, p. 76.
[10] Ziemssen's "Cyclopedia of the Practice of Medicine," Am. edition, vol. vii., p. 995.
[11] Loc. cit. [12] "Laryngismus Stridulus," London, 1836, p. 113.

designated as "bilateral paralysis of the abductors" is really a spasmodic condition. The two affections closely resemble each other in many of their clinical aspects. In a somewhat full discussion of this latter disease, which in many ways has a special bearing on laryngeal spasm, we have taken the ground that it constitutes true paralysis. The weight of evidence, on the other hand, would seem to indicate that the disease under present consideration is due to a spasm of the glottis-closing muscles.

The primary impulse which sets up the laryngeal spasm may originate in the cerebrum, in the motor centre of the larynx in the medulla, or it may arise reflexly from some local disturbances in the larynx, or in the intestinal canal, or, in fact, any portion of the body. Underlying these, is the impoverishment of the blood, with a resultant impairment of nutrition of the nerve centres. In the present state of our knowledge of the subject, any further attempt to explain the physiological pathology of laryngeal spasm would lead us into the domain of pure speculation.

SYMPTOMATOLOGY.—The attack comes on suddenly and without warning. A child giving no evidence whatever of a local disturbance in the larynx is suddenly seized with an attack of dyspnœa of an inspiratory character, which may last at first only a few seconds or at the utmost from two to three minutes, when the symptoms subside. The paroxysm is attended with all the ordinary dyspnœic symptoms. The entrance of air to the lungs is attended with a characteristic sonorous inspiration. The seizure generally occurs at night, the child starting up in bed, struggling for breath, and rapidly becoming cyanotic. The spasmodic character of the attack is also shown by the fact that the glottis is narrowed not only during the inspiratory act, but also during the expiratory act, as evidenced by the obstructive sound which accompanies the latter. In certain cases the glottis is completely closed at the onset of the attack, so that both inspiration and expiration for the time are completely arrested. This may persist for from ten to twenty seconds, when the muscular contraction yields somewhat, allowing a limited amount of air to pass, although both the expiratory and inspiratory dyspnœa may persist for some minutes even.

We thus see that the symptoms are simply those which result from a more or less complete closure of a healthy glottis, which persists for from a few seconds to even several minutes.

The disease is somewhat irregular in its course. The attacks may recur at varying intervals, several taking place within twenty-four hours, or several days may elapse before a recurrence of the attack. In general, the tendency is toward an increase both in frequency and severity of the seizures. This may persist for a few

weeks, when the attacks recur with a somewhat unvarying severity for a certain period, which is followed by a gradual amelioration of the symptoms. In other cases, the severity of the attack and the duration of the spasm may increase to such an extent that the child finally perishes from suffocation during an especially aggravated seizure. Even where there has been a notable improvement in all the symptoms, and when the attacks have apparently ceased for a considerable period of time, under the influence of some slight exposure, or perhaps an inflammatory attack involving the upper air tract, a relapse may take place in which a paroxysm may occur fully as grave as any previous attack.

As before stated, the attacks usually come on without warning, the child enjoying fairly good health. Reid[1] describes a prodromic stage of some days' standing, characterized by moderate laryngeal stridor without paroxysm. This certainly is a somewhat unusual symptom, and probably belongs to the clinical history of subglottic laryngitis.

In connection with laryngeal spasm, the child shows other evidences of irritation of the nerve centres, in the twitching of the limbs, extension of the feet, and clenching of the hands, while diaphragmatic spasm is not uncommon.

If the disease has persisted for some time, the child shows notable evidences of impaired nutrition. This is in part the result of the rachitic habit or such general condition as may have given rise to the disease, but in no small degree to the disturbed sleep and the severe tax on the general nervous system which the recurrent paroxysms involve.

DIAGNOSIS.—The diseases in young children which are characterized by spasmodic attacks, in addition to the affection under consideration, are: laryngeal tumors, bilateral paralysis of the abductor muscles, and subglottic laryngitis. A neoplasm gives rise to progressive dyspnœa, with impairment or complete loss of the voice. The spasm which occurs in these cases is a rare symptom, is somewhat mild in character, and is completely masked by the suffocative attacks, which are patently the result of some mechanical obstruction involving both inspiration and expiration. Riegel[2] has reported an instance of bilateral paralysis of abduction which commenced at the age of three. In a case observed by Warren[3] the disease set in at the same age; while Blake[4] reports a case in a girl aged six.

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[1] Loc. cit.

[2] Berliner klin. Woch., 1872, Nos. 20 and 21; 1873, No. 7.

[3] Boston Med. and Surg. Jour., Aug. 31st, 1876.

[4] Ibid., Aug. 23d, 1877.

In this disease the affection runs a more chronic course, the paroxysms of dyspnœa are longer and of not so severe a type; furthermore, evidence of that rigidity of the glottis which gives rise to both inspiratory and expiratory dyspnœa in true spasm is wanting. In addition to this, in true spasm of the larynx we usually meet with convulsive movements in some other portions of the body. The disease with which laryngeal spasm is most likely to be confused is subglottic laryngitis, the clinical history of which is in most instances marked by recurrent attacks of spasmodic dyspnœa, which usually occur at night. Moreover, there is a certain progressive element in it. That which more markedly indicate this form of the disease, is the train of catarrhal symptoms which usually accompany its development and progress; these are: cough and expectoration, with impairment of voice. The dyspnœic attacks, moreover, are almost purely inspiratory in character. An attack of true spasm of the glottis is not infrequently precipitated by a catarrhal laryngitis, but it is usually of a mild type, and is not characterized by any prominent symptoms other than the loss of voice; whereas a subglottic laryngitis is attended by febrile disturbance, a distressing cough, and a certain amount of secretion; the cough, moreover, is a hoarse, barking, tracheal cough, which has a distinctly croupy character. Our diagnosis, therefore, will rest on the absence of catarrhal disturbance, the impairment of the general health which is due to the rachitis or other blood condition which causes the disease, and the neurotic type of the symptoms as shown by the occurrence of convulsive movements in other portions of the body. The age of the patient is also to be taken into account, this form of disease occurring, as we have learned, usually during the first two years of life, and in the large majority of cases before eighteen months.

PROGNOSIS.—The disease is an exceedingly grave one, and the very large proportion of cases terminate fatally. Of 289 cases observed by Reid,[1] 115 succumbed; while Barthez and Rilliet[2] met with 8 deaths in 9 cases, and 6 out of 7 patients observed by Hérard[3] died. The disease would seem to be somewhat more fatal in boys than girls; thus, of 200 cases observed by Lorent,[4] there were 77 deaths, 45 being boys and 32 girls.

In any given case the prognosis is unfavorable according to the severity of the attack, the shortness of the interval between the paroxysms, and the extent of impairment of the general health.

TREATMENT.—If the child is seen during the paroxysm, prompt measures should be taken to curtail its duration as far as possible

[1] Op. cit. [2] Op. cit.
[3] Op. cit. [4] Cited by Steffen: Loc. cit.

by an abundance of fresh air, placing the child in a semi-recumbent position, loosening the clothing, applying sinapisms to the back of the neck, immersing the feet in hot water, and applying cold compresses to the head. The object of these measures is to diminish the blood pressure on the centres of laryngeal innervation. Any attempt to administer remedies by the mouth, of course, would be somewhat difficult. A sixteenth of a grain of morphine, in combiation with one five-hundreth of a grain of atropine, given hypodermically, would probably be quite safe in a child of eighteen months, and attended with good results. Paregoric or, better still, one of the anti-spasmodics, such as musk or castor, may, if the paroxysms are prolonged, be administered by the rectum; although we can scarcely anticipate very prompt action when given in this way. Capmas[1] suggested pressure on the pneumogastric nerves, thus interrupting the efferent nerve current; while Gavoy[1] recommends pressure on the carotid arteries. The stimulating action of ammonia, as well as the anti-spasmodic action of chloroform inhalations, have been recommended by a number of observers. Unfortunately, during the paroxysm in most cases, respiration is completely arrested, which would seem to eliminate any hope of success in this direction. The injection into the rectum of a few drops of chloroform suspended in milk or water would probably be attended by prompter results. The value of emetics, as recommended by many observers, is probably confined to those cases of laryngeal spasm which are dependent upon a subglottic laryngitis. If the paroxysm is prolonged, and unconsciousness sets in, this is attended with general convulsive movements, which are to be attributed now probably more to the poisoning of the nerve centres by the arrest of oxygenation than to the original affection which precipitated the laryngeal spasm. This complication presents, therefore, no new indication: the duty simply becomes imperative to relieve the dyspnœa, either by the introduction of a catheter into the larynx, by intubation, or by tracheotomy. In the absence of intubation instruments, tracheotomy would probably be the wiser resort, as in an emergency the instrument necessary for the performance of this can be improvised, whereas valuable time might be wasted in the futile attempt to insert a catheter into the larynx, since this latter is by no means a simple manipulation in very young children.

After the paroxysm subsides, the indications for treatment are to prevent as far as possible a recurrence of the attack, by combating the disease which has been its cause. The general health must be built up by the administration of cod-liver oil with the

[1] Thèse de Paris, 1867.

[2] Jour. de Méd. et de Chir. prat., 1882, p. 213.

hypophosphites in connection with the syrup of the iodide of iron: careful attention should be paid to the clothing; the functions of the skin should be maintained by the daily use of the cold bath; and especial care is to be taken as regards the diet, which should be of the most nutritious character, and at the same time easily assimilated.

Not infrequently a spasm is precipitated by the mere act of taking the breast, in which case it becomes necessary to feed the child with a spoon. The sleeping-apartments should be properly ventilated, and if possible the child taken daily into the open air.

As acting directly upon the convulsive tendency, certain internal remedies must be given, for practically this disease must be considered as very closely allied to eclampsia. Steffen[2] lays special emphasis on the internal administration of musk. Next to this in efficiency he ranks castor, administered for a somewhat long period. Of equal efficiency, probably, we may place bromide of potassium or sodium, or, perhaps better still, a combination of the two. Rehn[2] reports an instance in which the somewhat prolonged administration of chloral hydrate was successful. Percival[3] reports the treatment of 24 cases of the disease by antipyrine with uniform success. The well-known action of physostigma and curari in controlling convulsive movements naturally suggests their availability: the former may be given in half-drop doses of the fluid extract, and repeated every two to four hours until the physiological effect, as evidenced by the muscular weakness, is obtained; curari may be administered in fiftieth-of-a-grain doses. The possibility of difficult dentition is always to be borne in mind, and the gums watched for any possible source of irritation there. If such is found, free scarification should be promptly done. In the same way the condition of the bowels is to be carefully attended to, and the fæces examined for evidence of imperfect digestion.

Spasm of the Glottis in Adults.

The clinical history of spasm of the glottis as occurring in adult life presents an entirely different picture from that observed in children, in that it does not ordinarily involve any danger to life. Moreover, it is in most instances purely reflex in character, and is rarely dependent on any morbid lesion of the nerve centres, although we must undoubtedly recognize a somewhat abnormal excitability of the nervous system as predisposing to the attacks.

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[1] Loc. cit. [2] Jahrbuch für Kinderheilkunde, n. s., vol. iv., p. 430.
[3] Lancet, London, 1888, vol. ii., p. 961.

Laryngeal spasm may be excited by the entrance of food, drink, or other foreign substances into the larynx; by irritating topical applications, as by means of the sponge or probang; and by the presence of movable tumors. It also occurs in connection with tubercular and syphilitic disease of this organ. In the latter cases it is altogether probable that the spasm is excited by the entrance of solid or liquid food into the cavity, the act of deglutition being seriously interfered with by these affections. In the same way, any affection which interferes with this act may be attended with laryngeal spasm, such as pharyngeal paralysis, ulcerative processes in the pharynx or œsophagus, as well as tumefaction in any portion of the fauces. In these cases the laryngeal spasm becomes a grave symptom, according to the extent to which the food is thus diverted into the air tract.

Aside from the above cases, the disease probably is largely confined to those instances in which the muscular contraction is a reflex phenomenon excited by some diseased condition, either in the larynx or some other portion of the upper air tract. In this way, it may depend upon some catarrhal or other morbid condition of the laryngeal mucous membrane, or it may be excited by a diseased condition in the nasal passages or in the fauces.

One of the most troublesome cases which has come under my observation occurred in a man aged forty-five, whose disease dated from an attack of diphtheria thirty-three years previously. The attacks always occurred at night and during sleep. He was notably relieved by treatment for deflected septum and hypertrophic rhinitis. Another case occurred in a lady aged fifty, with nasal polypi. Her attacks came on during sleep, and were also precipitated by over-use of the voice during waking hours. She was completely cured by the removal of the polyps. This patient also suffered from asthma, which seems to have been entirely distinct from her laryngeal spasm. In two other cases the attacks were caused by atrophic rhinitis, and complete relief was afforded by very thorough douching of the nasal cavities at bedtime. I have seen some very distressing cases of laryngeal spasm in the chronic pharyngitis of alcoholism, brought on in the violent hawking and coughing which is characteristic of this disease, and also excited by the act of deglutition, which would seem to indicate that the pharynx may be the primary seat of the reflex impulse, as well as the nasal passages, although the latter is by far its most frequent seat, as has been demonstrated by the observations of Heryng,[1] Hack,[2] Hoffmann,[3] Przed-

[1] Annal. de Mal. de l'Oreille, 1886, pp. 59, 61, 91, and 93.

[2] Berliner klin. Woch., 1882, p. 383.

[3] Monatschr. für Ohrenheilkunde, 1885, No. 7, p. 207.

borski,[1] Sourdrille,[2] and Ruault.[3] The latter observer, in commenting on a large number of cases which he had collated and observed as dependent upon a diseased condition of the nasal passages, takes the ground that the laryngeal spasm is purely reflex in character. This would seem to be substantiated by the observations of Kratschmer,[4] who found that spasm of the glottis could be repeatedly excited in the lower animals by titillating the Schneiderian membrane. Most of the cases undoubtedly are reflex in character, and yet many instances, I think, admit of a simpler explanation. In two of my own cases of atrophic rhinitis, the larynx became irritated simply as the result of the abnormally dry air passing through the diseased nasal chambers. On the other hand, nasal stenosis, with its attendant mouth-breathing, may produce sufficient irritation of the laryngeal mucous membrane to produce the spasmodic contraction. I am disposed to think, therefore, that the primary impulse which excites the glottic spasm is in most instances a reflex from the laryngeal membrane itself, and that the influence of diseased conditions of the parts above is largely in producing morbid conditions in the laryngeal cavity.

I do not wish to be understood as taking the ground that all cases are purely reflex in character, since, in rare instances, the spasm may arise from pressure on the efferent nerves. Thus, Gottstein[5] reports a case in which the disease depended upon pressure on the recurrent nerve by a bronchocele. In something of the same category is the curious case observed by Hack,[6] in which glottic spasm was excited in an elderly man by a hyperæmic condition of the left pyriform sinus. The affection was entirely cured by topical applications to this locality. The internal branch of the superior laryngeal nerve passes over the superior border of the thyroid cartilage immediately in front of the superior cornu, and, traversing the outer wall of the pyriform sinus, forms a fold in the mucous membrane, the *plica nervi laryngei* of Hyrtl,[7] where it lies very superficially. It thus became the seat of irritation in the hyperæmic condition of the membrane in Hack's case.

Killian[8] reports a case in a woman aged thirty-seven in which glottic spasm occurred in connection with tetanic contraction of the muscles of the upper extremity. In hydrophobia, the glottic spasm is a somewhat adventitious accompaniment of the general

[1] Gazeta lekarska, 1886, No. 30.
[2] Thèse de Paris, 1887, p. 92.
[3] Arch. de Laryngol., vol. i., p. 289.
[4] Sitzungsber. der math.-natur. Klasse der k. Akad. d. Wiss., vol. lxii., pt. 2, p. 163.
[5] "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 194.
[6] Wien. med. Woch., 1882, vol. xxxii., p. 62.
[7] "Topog. Anat.," vol. i., p. 535.
[8] Monatschrift für Ohrenheilkunde, Berlin, 1884, vol. xviii., p. 104.

spasmodic contraction which involves all the muscles of the faucial region. The laryngeal crises in locomotor ataxia are considered by many observers as spasmodic in character. We have already discussed this point somewhat at length in the chapter on Bilateral Paralysis of the Abductors, and taken the ground that, whereas there may be something of a spasmodic element in these attacks, the prominent condition consists in a paralysis of the glottis openers. This is certainly true after the disease is fully developed. In the early stage of the disease, however, it is probable that the spasmodic element is more prominent. Thus, in cases of tabies accompanied by laryngeal crises observed by Cherchevsky,[1] Valpeau, and Krishaber[2] the laryngoscopic examination in the early stages of the disease revealed no impairment of motility in the laryngeal muscles.

These crises or attacks of glottic spasm can only be accounted for by an invasion of the respiratory centre in the medulla by the sclerotic process. This, therefore, produces in the early stage spasm of the larynx, and later a paralysis. Van Gieson[3] very shrewdly suggests that in these cases the harmony of the motor innervation is so far disturbed by the primary invasion of the sclerotic process that spasmodic contraction is easily excited by very slight reflex disturbances.

While, therefore, in exceedingly rare instances spasm of the glottis in adults may be excited by a central lesion or by pressure on the efferent nerves, in the large majority of cases we must seek for its cause in some reflex excitation having its origin in some portion of the air tract. Underlying these, in all instances, there is a peculiar nervous excitability, which renders these patients peculiarly subject to reflex disturbances. This is well shown in ordinary practice, where the impact of a probe upon the laryngeal membrane in the large majority of cases simply excites cough; if, however, we attempt this manipulation in a nervous patient, a laryngeal spasm is more likely to occur. That the disease, therefore, should be more common in females than males we can easily understand. On this account we should suppose that hysteria might be a cause of the affection. This, however, is doubtful. I regard it as an almost invariable rule that hysteria only causes those affections which can be perfectly simulated by purely voluntary effort. An hysterical spasm of the larynx would therefore be a somewhat coarse imitation, which would be easily detected.

SYMPTOMATOLOGY.—The only notable feature of the clinical history of laryngeal spasm in adults is the fact that it most frequently occurs at night, and usually during sleep. The patient is

[1] Revue de Méd., 1881, vol. i., p. 541. [2] Gaz. Hebdom., 1880, p. 858.
[3] Journal of Nervous and Mental Diseases, July, 1890.

suddenly awakened by a paroxysm of dyspnœa, which presents the characteristic features of glottic spasm, the labored and crowing inspiration, the struggle for breath, and the rapid supervention of cyanosis. The attack lasts from five to twenty seconds, and gradually subsides. This may be repeated again during the same night, or the attack may not recur for a considerable period. There is no periodicity of the disease, as is characteristic of the spasm in children. The severity of the paroxysms and their frequency of recurrence are largely dependent upon the actively predisposing and exciting causes.

The nocturnal attacks seem to be somewhat characteristic of those cases in which the spasm is a reflex disturbance from some diseased condition of the upper air passages. The occurrence of a glottic spasm in an adult during waking hours should lead to the suspicion, at least, that the disease is dependent upon some morbid condition of the nerve centres, or pressure on the nerve trunk. Where it is a crisis of locomotor ataxia, it is more apt to occur in the daytime and is usually preceded by a cough.

DIAGNOSIS.—The clinical history of the case enables us easily to establish the diagnosis: the main interest, however, is in ascertaining the cause of the affection. The elimination of a diseased condition of the nerve centres, or pressure on the efferent nerve trunk, suggests the reflex character of the seizures. This will be more fully established by discovering some diseased condition of the upper air tract, such as atrophic or hypertrophic rhinitis, deflected septum, nasal polypi, pharyngeal adenoids, or other obstructive lesions either in the nasal passages or in the naso-pharynx. In exceedingly rare instances laryngeal crises constitute the first symptom of locomotor ataxia; in such cases the diagnosis is involved in no little difficulty. In most cases, however, of tabes, the laryngeal symptoms, if they exist, are accompanied with or preceded by other symptoms, such as the loss of patellar reflex, the Argyle-Robertson pupil, and the ataxic gait. If the attacks are the result of pressure upon one of the efferent nerves, this will be evidenced in the laryngoscopic image by the impairment of motility in the muscles supplied by that nerve.

The clinical history of bilateral paralysis of the abductors is marked by recurrent dyspnœic attacks, which present all the characteristic symptoms of laryngeal spasm. In these cases, also, the laryngoscopic image easily reveals the absence of abductor action in the movements of the glottis.

PROGNOSIS.—These attacks involve discomfort and apprehension to the patient rather than danger to life. In my experience they are quite amenable to treatment, and an improvement in the se

verity of the paroxysms follows promptly upon remedial measures directed to the ascertained cause of the affection, where it has been reflex in character, and dependent upon a diseased condition of the upper air tract; and even in cases where it is dependent upon organic disease of the nerve trunk or medulla, much can be anticipated from remedial measures to overcome the irritability of the mucous membrane of the laryngeal cavity or passages above, as may be indicated.

I know of no case of reflex laryngeal spasm in the adult which has terminated fatally, yet a number of instances have been reported in which tracheotomy became imperative. Heryng[1] reports two cases, both females, in one of which tracheotomy was done four times, and in the other twice, for glottic spasm dependent upon intra-nasal disease. The ultimate result seems to have been a radical cure.

That a fatal termination may ensue where the paroxysm is due to locomotor ataxia, it is not difficult to understand. Munschina[2] has collated seven such cases. In the case reported by Van Gieson, also, death seems to have been due to this cause, the laryngeal crisis coming on in the fifth year of the tabes. This was also the probable cause of death in one of Oppenheim's[4] cases, while in a case observed by Krishaber[5] suffocation was forestalled by the insertion of a tracheal canula.

TREATMENT.—Underlying these cases we must recognize a hyper-sensitive condition of the general nervous system. The first indication for treatment consists in measures directed to the control of this condition. This seems best secured by the administration of bromide of potassium or sodium, in from ten to fifteen grain doses three times daily. This is to be increased five grains daily until the desired effect is produced or bromism occurs. Its administration is to be continued for a somewhat prolonged period. In addition to this, the judicious use of the cold bath should be enjoined for its general tonic effect on the nervous system, as well as for the purpose of stimulating healthy activity of the cutaneous functions. The wearing of thin woollen underwear, a certain amount of outdoor life, with physical exercises, and such other hygienic measures as may seem indicated, will aid much in this direction.

An equally important indication consists in the removal of such local morbid conditions of the upper air tract as may be discovered upon examination. If atrophic rhinitis exists, the laryngeal spasm

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[1] Annal. des Mal. des l'Oreille, 1886, pp. 91 and 93.
[2] Thèse de Paris, 1885. [3] Loc. cit.
[4] Arch. für Psych., 1889, vol. xx., p. 131. [5] Loc. cit.

is to be attributed to the drying up of the mucous membrane of the larynx as the result of the deficient secretion of serum in the nasal cavity. The indication here is in supplying such moisture to the nasal passages as nature fails to afford; hence the constant and frequent use of the douche or spray becomes imperative in connection with measures to overcome the unusually sensitive condition of the nervous system.

If nasal polypi, deflected septum, pharyngeal adenoids, or other obstructive lesions are found, these are to be removed in the manner already described in the previous chapters. Where the disease is dependent upon a morbid condition of the nerve trunk or centres, the same indications are present, as affording us a means of relieving the severity of the spasm; for we must recognize the fact that even in such cases the severity of the glottic spasm may be notably aggravated by any morbid condition of the mucous membrane of the larynx or the parts above; and even where such lesion does not exist in the air passages, the irritability of the parts may be controlled by soothing local applications, such as a two-per-cent solution of cocaine, or perhaps inhalations of an infusion of poppies, lupulin, conium, benzoin, or other local sedatives.

If the paroxysms are of such a severe type as to imperil the safety of the patient, the temporary insertion of a tracheal canula may become necessary until the exciting cause of the spasm has been removed. Ruault[1] reports a case, in a female of hysterical temperament, in which the paroxysms were permanently arrested by the simple assurance of a cure after laryngoscopic examination. Przedborski[2] arrested the attack in a similar case for four weeks by going through the primary incisions in tracheotomy, a final cure being affected by the relief of an hypertrophic rhinitis.

Laryngeal Inco-ordination.

In addition to the various neuroses of the larynx already described, we have a group of affections in which the essential feature of the disease consists in a deficiency in the co-ordinate control or direction of the laryngeal muscles. This lack of co-ordination manifests itself in the form of a spasmodic contraction of the glottis. In ordinary spasm of the larynx the condition has mainly to do with the inspiratory act, the glottic-closure preventing the entrance of air to the lungs. In the group of diseases under consideration, the spasmodic contraction, on the other hand, has entirely to do with expiration. On this ground we might reasonably designate

[1] Arch. de Laryngol., vol. i., p. 289. [2] Loc. cit.

these affections as forms of expiratory spasm, in that the spasmodic closure of the glottis is manifested in all cases during the expiratory act.

The affections which we group under this designation are: *First*, chorea of the larynx; *second*, dysphonia spastica; and *third*, laryngeal vertigo. As showing the expiratory character of the spasm in all these affections, we find that in the first there is a momentary and complete closure of the glottis against the expiratory act, followed by a sudden breaking through, as it were, of the pent-up air. In the second form, the spasm occurs during the expiratory movement which is necessary for phonation. In the third form of disease, the glottic closure occurs when the lungs are filled with air by the inspiratory act, and is of such a character that, during its momentary persistence, the voluntary expiratory effort is unable to overcome it.

CHOREA OF THE LARYNX.—The prominent feature of this form of laryngeal spasm consists in a persistent, noisy, dry cough, which so closely resembles the bark of a dog that those who suffer from it are commonly called "barking children." It persists with but little interruption during waking hours, but ceases during sleep. This bark is incessant, and is repeated at varying intervals. In some cases it occurs every two or three minutes, or even more frequently, from the time of waking in the morning until the patient falls asleep at night. In other cases the intervals are somewhat irregular. The tone of voice is not affected, and conversation between the seizures is usually carried on easily, although occasionally articulation may be somewhat jerky and spasmodic in character. It is preceded by no recovery or drawing in of the breath, as is characteristic of an ordinary cough, but comes on constantly without regard to respiratory movements, and is completed with a single bark in most instances, although in certain cases there is a succession of barks of diminished intensity. It occurs usually at about the age of puberty, and mostly in females; thus, the three cases reported by Lefferts were girls aged respectively fifteen, sixteen, and twenty. Roe[2] has seen two cases in girls aged thirteen and seventeen; Schnitzler[3] reports a case in a girl aged eighteen; Wheeler[4] reports a case in a girl aged twelve; Mandl[5] also reports a case as occurring in a young girl; Morgan[6] has observed the affection in a girl ten years of age. Knight's[7] experience was somewhat

[1] Trans. Amer. Laryngol. Ass'n, 1879, p. 234.
[2] Ibid., p. 243.
[3] Wien. med. Presse, 1875, No. 22, p. 477.
[4] Boston Med. and Surg. Jour., Oct. 17th, 1878.
[5] Gaz. des Hôp., 1861, p. 13.
[6] Trans. Amer. Laryngol. Ass'n, 1883, p. 29.
[7] Trans. Amer. Laryngol. Ass'n, 1883, p. 23.

unique, in observing a case in a woman aged forty-two; while Holden[1] observed a case in a man aged fifty-seven.

The instances observed by Giessler[2] and Voltolini[3] seem to have been hysterical in their origin, while one of Chiari's[4] cases was an instance rather of chorea of the expiratory muscles of the thorax. He reports another case, however, of true laryngeal chorea in a boy aged twelve. Gottstein[5] takes the ground that choreic movements do not occur in the larynx, and he describes these cases as instances of nervous cough. I regard the two affections as entirely distinct: a nervous cough is the result of a perverted sensation, which sets in play all the muscular movements by which an ordinary cough is produced, only differing from the latter practically in the failure to expel the offending irritant. The choreic bark, on the other hand, is an interference with the rhythmical impulse which originates in the respiratory centre. This gives rise to a fully developed glottic spasm, the nature of which cannot be questioned, although it persists but for a few seconds.

These cases usually tolerate a laryngoscopic examination, and in this way the spasmodic character of the glottic contraction is readily observed. During the intervals the movements of the larynx are normal, vigorous, and well co-ordinated. The occurrence of the paroxysm is evidenced by the sudden and sharp closure of the glottis; the cords are driven together, as Lefferts puts it, as if by some great external force. Knight[6] even claims to have heard the "click" of this impact, although this sound was more probably due to the palatal spasm which is reported to have occurred (see page 329). After the cords have remained in this approximation for one or two seconds, they are again separated by a somewhat similar quick movement, being drawn well back to the sides of the larynx. This glottic spasm seems to excite a sudden expulsive effort on the part of the expiratory muscles of the thorax, by which the glottis is forcibly opened after the closure has persisted for one or two seconds, and this is accompanied by the characteristic loud bark which is peculiar to the paroxysm.

The choreic character of the disease is still further manifested by the fact that we occasionally meet with similar choreic movements in other portions of the body, although these are absent in the majority of cases.

DYSPHONIA SPASTICA.—This affection, which is designated both as aphonia and dysphonia spastica, was first described by

[1] Trans. Am. Laryngol. Ass'n, 1884, p. 128.
[2] Jahresb. der Gesellsch. für Nat. und Heilk. in Dresden, Leipzig, 1879.
[3] Monatschr. für Ohrenheilk., 1880. [4] Ibid., 1881.
[5] "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 200. [6] Loc. cit.

Schnitzler.[1] It differs from laryngeal chorea, already described, in the fact that the glottic spasm only occurs during an attempt at phonation. Schech[2] reports two cases, both in adult females: Nothnagel reports a case in a nervous woman: Fritsche[4] reports six cases, all of whom were females; Hack[5] reports two cases as occurring in adult males; Gerhardt also reports two cases as occurring in adult males. We learn from these cases that the disease is practically one of adult life, and occurs more frequently in females than males.

The onset of the attack is marked by impairment or complete loss of voice. This is soon followed by the development of the peculiar spasmodic character of the disease, under the influence of which, whenever the patient attempts to phonate, the cords are brought into such absolute apposition that the glottis is completely closed, thus preventing the exit of air for phonative purposes. This closure in all cases involves the ligamentous glottis, but occasionally the cartilaginous glottis may remain slightly patulous. Phonation, of course, is completely abolished in every case. In some instances the closure of the glottis is not sufficient to completely prevent the exit of air, but in these cases the tension is such that the voice is thrown into the falsetto register. Schnitzler[7] likens this affection to writer's cramp, an analogy which seems well drawn, as in many cases the disease seems to develop in individuals from over-use of the voice, and the spasm is precipitated by an attempt to bring into use the overtaxed and wearied muscles.

The spasm appears to continue as long as the impulse from the phonatory centres is sent along the efferent nerves, and ceases instantly upon the cessation of the conscious effort to talk. Where the attempt at phonation is persisted in, cyanosis may occur, the glottic spasm thus kept up acting practically in the same way as a laryngeal spasm of similar duration from other causes. If a laryngoscopic examination is made, the movements of the larynx will be found normal and vigorous in every way. On attempts at phonation, the cords will be adducted as in health. Immediately upon approximation, however, a spasmodic contraction ensues, by which the phonatory glottis is completely closed. So close is this approximation that one cord may overlap the other, while one of the arytenoid cartilages falls in front of its fellow. Immediately

[1] Wien. med. Presse, 1875, No. 20, p. 429.

[2] Aerztl. Intelligenzblatt, 1879, No. 24.

[3] Deut. Arch. für klin. Med., 1881, vol. xxviii., p. 304.

[4] Berliner klin. Woch., 1880, pp. 214, 230.

[5] Wien. med. Woch., 1882, vol. xxxii., pp. 93, 125.

[6] Deut. Arch. für klin. Med., 1872–73, vol. xi., p. 580, and Arch. of Laryngol., vol. i., p. 119.

[7] Loc. cit., p. 477.

upon the abandonment of the attempt at phonation, the normal respiratory movements of the larynx are seen to take place. Jurasz[1] reports a case in which the cords were driven together forcibly in the manner described in laryngeal chorea.

James[2] reports a case of what he calls "stammering of the vocal cords," which would seem to have been a form of spastic aphonia, in which the attempt at phonation resulted in certain irregular spasmodic movements of the vocal cords, the phonatory closure of the glottis not being accomplished until after considerable effort. The laryngeal movements were rather of a choreic character, which would indicate a relationship between dysphonia spastica and laryngeal chorea. In Schnitzler's case the onset of the disease was sudden, and was attended with as great a severity of laryngeal spasm as characterized any period of its course. In Hack's cases there was a progressive increase in the severity of the attacks, covering a considerable period of time; while in one of Gerhardt's cases the attacks not only increased in severity and frequency, but finally were precipitated by causes other than phonatory effort, such as any nervous excitement and over-exertion. A close relation between this affection and laryngeal vertigo, to be described later, would seem to be established by the fact that in this latter case the severe attacks occasionally resulted in complete loss of consciousness. In many cases pain seems to have been a somewhat prominent symptom, the patient experiencing a feeling as of a cramp or sense of constriction, in the laryngeal muscles.

Laryngeal Vertigo.—This is the name which was first used by Charcot[3] to designate a curious form of laryngeal spasm which is followed immediately by vertigo and loss of consciousness. A patient in apparent perfect health is suddenly seized with a mild sense of tickling or irritation of the larynx, which produces a slight cough. This is immediately followed by an obscurity of vision, dizziness, and he falls to the floor in a state of complete unconsciousness. This lasts for a few seconds, when consciousness returns. The attack entails no sense of either physical or intellectual weakness or discomfort; in other words, the recovery is absolutely complete. In a case reported by McBride the seizure was occasionally preceded for a brief instant by an obscure sense of uneasiness. Ordinarily, however, there are no premonitory symptoms.

The attacks recur at irregular intervals varying from a few days

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[1] Deut. Arch. für klin. Med., 1880, vol. xxvi., p. 157.

[2] Lancet, London, 1879, vol. ii., p. 726.

[3] Gaz. méd., Paris, 1876, p. 588. Revue des Sciences méd., vol., x., p. 135. Prog. méd., 1879, p. 317.

[4] Edinburgh Med. Jour., 1883–84, vol. xxix., p. 790.

to weeks and even months, and usually come on without assignable cause, although in some instances they seem to have been precipitated by nervous excitement, weariness, or over-exertion. In mild attacks the seizure may pass away with the occurrence of simple dizziness and obscurity of vision, and before unconsciousness has occurred. In two of Charcot's[1] cases, and also in one reported by Grey,[2] there were muscular twitchings during the unconscious state of the attack, from which the latter observer was disposed to regard the disease as epileptic in character, designating it as "laryngeal epilepsy."

Immediately preceding the attack, the patient draws a full inspiration, when, the glottis being closed by spasmodic contraction, expiration is arrested. The futile attempt to force the air through the closed glottis results in increased intra-thoracic pressure, interruption of the circulation, and marked diminution of the vigor of the cardiac contractions. This latter fact has been very conclusively demonstrated by McBride,[3] who has shown that if one voluntarily fills the chest with air, and strains vigorously, the sphygmographic tracings, at the end of very few heart-beats, will be reduced practically to a straight line. Weber[4] long previously had shown that the same voluntary straining would produce vertigo, and, in his own individual case, muscular twitchings and even loss of consciousness. The ultimate result of these conditions is a disturbance of the circulation of blood, both about the motor centres of the larynx in the medulla, and also in the psychic centres of the cranial cavity. This chain of phenomena occurring in individuals of a neurotic habit serves to explain the clinical features of the disease, for although in Leffert's[5] cases and in some others there was no family history of nervous disease, the occurrence of this affection must be regarded as evidence of the neurotic habit. Grey's[6] view, that the disease is a form of epilepsy, does not seem to be well established when we consider that in many instances the seizure terminates with the occurrence of the vertigo and without the loss of consciousness, whereas even in the milder form of *petit mal*, we consider that the momentary loss of consciousness establishes the epileptic character of the disease, while epileptic vertigo is usually attended by a train of symptoms of a somewhat pronounced character. And yet there can be no question that there are many features of the disease which suggest that analogy between it and either the *petit mal* or epileptic vertigo.

In most instances the laryngeal cavity presents no evidence of

[1] Loc. cit. [2] American Journal of Neurology and Psychiatry, 1882, p. 588.
[3] Loc. cit. [4] Müller's Archives, 1851.
[5] Archives of Laryngol., 1883, vol. iv., p. 165. [6] Loc. cit.

local morbid lesion, although in cases observed by Gasquet[1] and Phillips[2] the attacks seemed to be dependent upon a catarrhal laryngitis.

The disease is a somewhat rare one. In addition to those already referred to, I find observations on the subject by Krishaber,[3] Russell,[4] Massei,[5] Knight,[6] Gleitsmann,[7] Hermes,[8] Adler,[9] Armstrong,[10] and Dauvin,[11] although the latter is a somewhat doubtful case.

The disease is easily recognized by the clinical symptoms, and is fortunately not dependent in any way upon laryngoscopic examination, in that, in the nature of the case, such could not be made during the momentary occurrence of the seizure.

Prognosis.—None of these affections involve any dangerous tendencies, as far as life is concerned. In chorea and disphonica spastica the disease is an essentially chronic one, and often resists for a long time all methods of treatment. In laryngeal vertigo, on the other hand, the prognosis seems to be favorable as regards treatment, in that all cases so far reported seem to have been permanently cured after a comparatively short course of medication.

Treatment.—All these cases, being of neurotic origin, demand that our first efforts should be directed toward the correction of the systemic condition. For this purpose general tonics, such as barks and iron, cod-liver oil and hypophosphites, may be used. Strychnia is usually contra-indicated. The preparations of zinc, belladonna, and phosphorus have been extensively used, but without any notably good results. The stimulating and tonic effect upon the general nervous system of cold water, in the form of either the sponge, shower, or tub bath, is so well known that its value in these cases cannot be questioned. Among special measures it should occupy a prominent place. Its best effect is in producing a certain amount of shock upon the system, and this of course is secured most promptly in the use either of the shower or douche. The action of the bath is to be closely watched, and its use can only be continued, of course, in those cases in which a proper reaction

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[1] Practitioner, 1878, vol. xxi., p. 81.
[2] Med. News, Phila., March 19th, 1892.
[3] Annal. des Mal. de l'Oreille, 1882, p. 12.
[4] Birmingham Med. Review, 1884, vol. xvi.
[5] Giornale Internaz. delle Scienze Med., vol. vi.
[6] Trans. Amer. Laryngolog. Ass'n, 1886, p. 34.
[7] Med. Monatschrift, vol. i., p. 510.
[8] Jour. de Méd. de Paris, 1887, p. 936.
[9] N. Y. Med. Jour., Jan. 30th, 1892.
[10] Med. News, Phila., June 8th, 1889.
[11] Revue de Laryngol., 1888, vol. viii., p. 156.

follows the immersion. Among general hygienic measures which are to be considered are: the proper regulation of the clothing, exercise, fresh air, the regulation of the diet, and the proper ventilation of living and sleeping apartments.

Too much importance cannot be attached in these cases to the correction of such morbid conditions as may be found in the upper air tract. While in probably all these cases the neurotic habit is the active predisposing cause of the attack, I am confident that the outbreak is in many instances directed to the larynx by some diseased condition of either the nasal passages or the faucial region. In one of my own cases of laryngeal chorea, the cure was effected by treating an hypertrophic rhinitis; while in Adler's case of laryngeal vertigo, the disease was only arrested after the amputation of an elongated uvula. The diagnosis, therefore, in these cases is not complete until the whole of the upper air tract has been explored, and our therapeutic efforts not fully exhausted until such lesions as may be found there are removed.

While the general method of treatment in all forms of laryngeal inco-ordination is the same, there are certain special points to which attention should be called in connection with the separate affections.

Chorea of the Larynx.—The first indication for treatment in this affection is in the correction of any morbid condition which may be found in any portion of the upper air tract. In the case of a young lady aged twenty, under my care some years ago, a complete cure was effected at the end of three months by the internal administration of Fowler's solution of arsenic, in doses increasing to tolerance, and the relief of a nasal stenosis due to hypertrophic rhinitis and deflected septum. In one of Leffert's[1] cases relief was afforded by amputating an elongated uvula, while the ultimate cure was accomplished by the use of bromide of potassium, belladonna, and the faradic current. Even where there is no local lesion in the larynx or air tract, soothing applications undoubtedly afford temporary relief. For this purpose we may use inhalations of conium, hyoscyamus, lupulin, papaver, or perhaps resort to local applications of a solution of morphia or cocaine. In another case in my own practice, of a young girl of thirteen, in whom the strident bark occurred every few seconds during the waking hours, the cough was completely controlled by the inhalation of hot steam. The child was compelled to carry a steam-inhaler about constantly. I saw this case but once, but learned subsequently that no radical measure had been of any avail. In another case, of a young lady aged sixteen, there was notable swelling of the subglottic tissue,

[1] Loc. cit.

in connection with enlarged faucial and lingual tonsils. The cough, however, was of a distinctly choreic character. In this case the subglottic swelling subsided upon the removal of the faucial and lingual tonsils, with marked relief to the cough, although further treatment in the way of soothing and astringent applications to the site of the lingual tonsil and to the larynx, together with the administration of general tonics, became necessary.

The literature of the subject seems to indicate that in a majority of cases the remedies which have shown the best results, in addition to general hygienic measures, have been the internal use of bromide of potassium given in full doses, and the use of the faradic current, although Knight[1] recommends the use of the continuous current.

I think we must recognize the fact that the morbid impulse which produces the cough in these cases frequently has its origin in the laryngeal cavity, and that this results either from a hyperplastic condition of this region or from some morbid lesion of the air tract. I repeat, then, that our treatment should be based on a recognition of this fact.

Dysphonia Spastica.—In this form of inco-ordination the indications for treatment are practically those already enumerated in connection with chorea of the larynx, with the addition of such complete rest to the organ as can be enforced, together with the use of the constant current, as recommended by Schnitzler,[2] who directs that the positive pole be placed over the cervical vertebra, and the negative pole passed up and down the whole length of the spinal cord. These applications should be made daily until a cure is effected.

In a number of the reported cases a cure was attributed entirely to Schnitzler's method of galvanism, although other remedies seem to have been used according to indications. In one of Schech's cases the cure was attributed to the internal administration of iron and the treatment of an ozæna.

Laryngeal Vertigo.—The neurotic element is especially prominent in this form of laryngeal inco-ordination; and in addition to the general measures already referred to, the patient should be brought thoroughly under the influence of the bromides.

If, however, any morbid condition of the upper air tract is found, the bromides will fail of their beneficial action until this is corrected by proper treatment. In Gasquet's and Phillips' cases, the attacks appeared to be arrested by the local treatment of a catarrhal laryngitis.

[1] Loc. cit. [2] Loc. cit.

CHAPTER XLI.

FOREIGN BODIES IN THE AIR PASSAGES.

THE entrance of a foreign body into the larynx or air passages below during the act of mastication, deglutition, or inspiration gives rise to more or less grave symptoms, according to the size, character, and location of the body.

ETIOLOGY.—The articles which may thus make their way into the breathing-tract cannot well be enumerated, comprising as they do almost every known substance, such as pins, coins, particles of food, pebble-stones, natural and artificial teeth, peas, beans, fragments of bone, buttons, nutshells, lumbricoides, hydatids, etc. We exclude from this consideration the entrance of fluids into the larynx during the act of deglutition, in that they ordinarily give rise to but temporary discomfort, except in those grave morbid conditions of the larynx such as tuberculosis and cancer, although Monteggia[1] reports a fatal result from the entrance of water into the larynx during the act of swallowing.

In the large majority of instances the accident occurs during the act of inspiration, the individual drawing a heedless or perhaps involuntary breath while food or other solid matters are in the mouth. By an unconscious act of inspiration I mean that which occurs from a sudden impulse of laughter or during the act of sneezing, the act being thus to an extent beyond the control of the individual.

Occasionally a foreign body may come from below. Thus, Edwards[2] reports the case of a child in whom a diseased bronchial gland, having made its way into the bronchial tube by an ulcerative process, passed up and lodged in the larynx. In a case reported by Kjerner,[3] death resulted from occlusion of the trachea by the entrance of cheesy matter from an ulcerating bronchial gland. Another case is reported,[4] in which a cork inserted between the teeth during anæsthesia made its way into the air tract, causing death. It is by no means an infrequent accident that matters vomited make their way into the air passages. Instances of this

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[1] "Inst. Chirurg." [2] Medico-Chirurgical Transactions, vol. xxxvi.

[3] Hygeia, Nordiskt med. Ark., vi., No. 1.

[4] Cincinnati Lancet and Medical Observer, 1867.

kind have been reported by Vidal de Cassis,[1] Parrot,[2] and others. This is especially liable to occur during insensibility from intoxication-paralysis, and also in new-born children. Howse[3] reports a case in which an adult coming out from under the influence of an anæsthetic vomited copiously, and the ingesta made its way into the trachea, producing death, notwithstanding tracheotomy. Smyth[4] reports a similar accident with fatal issue, in a child, immediately following a surgical operation without anæsthesia. Ruehle[5] reports a very curious accident which comes under this category, consisting of the impaction of the epiglottis in the larynx. This occurred in a young woman while eating. Under the impression that the symptoms were the result of the entrance of food into the larynx, Ruehle inserted his forefinger and found the crest of the epiglottis bent under the arytenoid cartilages. He succeeded in disengaging it, thereby immediately relieving the dangerous symptoms.

The entrance of a living leech into the larynx seems a somewhat curious accident, and yet instances have been reported by Massei,[6] Ridreau,[7] Clementi,[8] Ramon de la Sota,[9] and Vital,[10] in all of which the leech was taken in with drinking-water. In the latter case laryngotomy became necessary, while in the others the animal was extracted through the natural passages. Guyon[11] reports a similar accident which occurred during careless application of the animal to the mouth.

Fürst[12] has collated twenty-five cases in which lumbricoides made their way into the air passages, twenty-two of which terminated fatally.

Children occasionally fall asleep with foreign bodies in the mouth, such as coins, buttons, toys, etc., which are thus exceedingly prone to make their way into the air passages. A remarkable case of this sort is reported by Johnston:[13] A child fell asleep with a toy engine in the mouth, which passed into the air passages, causing such severe dyspnœa as to necessitate tracheotomy. Some months later, its position being detected by the laryngoscope, it was extracted after thyrotomy. Burow[14] reports a case in which

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[1] "Elements de Path.," vol. iii.
[2] L'Union médicale, 1868, vol. ii., p. 167.
[3] Brit. Med. Jour., 1876, vol. ii., p. 381.
[4] Lancet, London, 1874, vol. ii., p. 504.
[5] "Die Kehlkopf-Krankheiten," Berlin, 1861, p. 13.
[6] Il Morgagni, Oct., 1874, p. 750.
[7] Gaz. méd. de L'Algère, 1869, Nos. 1 and 2.
[8] Gaz. med. Ital., 1874, No. 48.
[9] Revista med. de Sevilla, Nov., 1883, p. 20.
[10] Gaz. médicale, 1838.
[11] "Elements de Chirurgie clinique," Paris, 1873.
[12] Wien. med. Woch., 1879, vol. xxix., pp. 52, 111, 140.
[13] Archives of Clinical Surgery, December, 1876.
[14] Woch. für die gesammt. Heilk., Berlin, 1849, p. 614.

the larynx of a goose was successfully removed from the larynx of a child after tracheotomy.

False teeth also occasionally become dislodged during sleeping-hours and fall into the air passages. As a rule, however, they become arrested in the pharynx. Instances of this have been reported by Craigie,[1] Wallace,[2] Carpenter,[3] Oertel,[4] and Major.[5] The latter case was especially interesting in that on the morning following the accident the patient was quite unconscious of what had happened. A cough with dyspnœic symptoms subsequently developed, together with evidences of a localized pneumonia. The plate was subsequently recognized by a laryngoscopic examination, lying on the bifurcation of the trachea. It was successfully removed after tracheotomy, having been in position 113 days.

The pharynx is the seat of a very high degree both of motor and sensory innervation, and in the very large majority of instances where a foreign body reaches the pharynx, it is immediately expelled by the prompt reflex action which its presence excites. When this sensibility is diminished, as during sleeping-hours, we can easily understand how conditions are established which favor the passage of foreign bodies beyond this region, and into the larynx and trachea. The pharyngeal insensibility of anæsthesia is even still more marked than in sleep, which will in part explain the accidents which occur in this state. Instances are reported by Agnew,[6] Mears,[7] and others in which a cork inserted between the teeth to keep the mouth open during an operation became dislodged and fell into the air passages. In this connection should be mentioned a case reported by MacCormac,[8] of a young lady, aged twenty-five, who was anæsthetized for the extraction of a molar tooth. During the operation one blade of the dental forceps broke off at the joint, and fell into the air passages. Its presence gave rise to dyspnœic symptoms, with cough and pain between the second and third ribs about three centimetres to the right of the sternum and extending through to the spine and the scapula. A muco-purulent expectoration soon set in, which was occasionally streaked with blood. Various attempts were made to dislodge the object by position, emetics, etc., without avail.

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[1] Edinburgh Medical and Surgical Journal, vol. xlii., p. 105.

[2] Boston Medical and Surgical Journal, vol. xvi., p. 205.

[3] Guy's Hospital Reports, 1st series, vol. vii., p. 353.

[4] Schmidt's Jahrbuch, 1868, vol. cxxxviii., p. 232.

[5] Archives of Laryngol., New York, Oct., 1882, p. 350.

[6] "Principles and Practice of Surgery," vol. iii., p. 45.

[7] Personal communication to Cohen: Ashhurst's "International Encyclopedia of Surgery," vol. v., p. 261.

[8] Lancet, London, Jan. 2d, 1886.

Six weeks after the accident tracheotomy was performed; and a slender forceps passed down the trachea discovered the object, lodged in the right bronchus. After prolonged effort, it was finally seized by the forceps and withdrawn.

A curious case is reported by Poulet[1] in which an umbrella handle made its way into the left bronchus, setting up pneumonia, purulent pleurisy, and finally causing death. Appleyard[2] records an instance in which a button-hook was swallowed by a child five years of age. No symptoms were experienced for seven days, when the child was seized with vomiting, followed by hoarseness, cough, and pain in the tracheal region. Ten days later, the object was expelled during an attack of coughing.

We should naturally infer that in a majority of instances a foreign body entering the air tract would find lodgement in the irregular surfaces of the laryngeal walls; and Durham,[3] in an analysis of 15 cases, found that in 7 the larynx afforded lodgement for the substance, in 5 the trachea, in 2 the right bronchus, and in one the left bronchus. Bourdillat,[4] however, on the other hand, in an analysis of 156 cases, found that the body was arrested in the trachea in 80 cases, in the larynx in 35, in the right bronchus in 26, and in the left bronchus in 15.

SYMPTOMATOLOGY.—In very rare instances a foreign body may make its way into the air passages without the individual being cognizant of the accident, as in the curious cases reported by Major,[5] Boyce,[6] and others, the symptoms being delayed until local inflammatory changes set in, giving rise to cough, pain, dyspnœa, etc. Occasionally the symptoms may be comparatively light from the onset. In the very large majority of cases, however, the occurrence of this accident makes itself known by the immediate development of symptoms of a somewhat distressing character. The patient is seized with a sudden choking or gasping for breath, with a feeling of impending suffocation. The dyspnœa is usually of an inspiratory character, the presence of the foreign body setting up a spasm of the larynx. The alarm and anxiety of the patient is shown by his restless movements: he rushes to the window or door in a hopeless effort to obtain air; the eyes protrude and the face soon becomes livid from defective oxygenation. These symptoms may continue until death ensues, or at the end of a few minutes they may gradually subside, and fairly normal

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[1] "Foreign Bodies in Surgical Practice," Amer. ed., New York, 1880, vol. ii., p. 59.
[2] Medical Press and Circular, February 2d, 1887.
[3] Holmes' "System of Surgery," vol. ii., p. 477.
[4] Gaz. médicale, 1861, p. 135.
[5] Loc. cit.
[6] Lancet, London, May 28th, 1887.

respiration set in. The subsequent history of the case is marked by recurrent attacks of a dyspnœic character, apparently dependent somewhat on the position and movements of the individual, and perhaps on the character and location of the foreign body. If the substance be smooth and rounded, and possesses no especially irritating properties, it may remain in the air passages for a long period without giving rise to notable local changes; thus Cohen[1] reports two instances in which foreign bodies remained in the air passages for ten years without producing marked local changes, in one of which a pebble-stone was expelled long after the accident had been forgotten; while in a case observed by Cameron[2] a penny was removed from the larynx of a child which had been present for six years.

As a rule, the impact of the foreign body upon the delicate structures of the air tract gives rise to inflammatory and ulcerative processes. This morbid action may confine itself to the immediate neighborhood of the foreign body, or it may set up changes in the lungs and surrounding tissues. Among the direct results of its presence, therefore, we may enumerate, according to its location, laryngitis, œdema of the larynx, abscess of the larynx, inflammation or ulceration of the trachea or bronchi, emphysema, pneumonia, pleurisy, abscess of the lungs, and necrosis of the cartilages, whether of the larynx or trachea. As the result of these conditions the continued presence of the foreign body thus gives rise, if in the larynx, to hoarseness, loss of voice, and recurrent or permanent laryngeal spasm, with cough and expectoration. If the foreign body is located in the trachea or bronchi, we have persistent cough, with more or less muco-purulent expectoration, which is perhaps tinged with blood, together with dyspnœa. The long-continued presence of the foreign body, with its resultant ulcerative action, gives rise to marasmic symptoms, as progressive loss of flesh, febrile disturbance of a hectic nature, night sweats, loss of appetite, and other symptoms which so closely resemble an attack of pulmonary phthisis as to lead not infrequently to a mistaken diagnosis. If pneumonia, pleurisy, or other secondary morbid processes set in, they give rise to symptoms characteristic of such affections. The bronchitis which occurs is peculiar, in that it assumes somewhat of an intermittent type, the history of the case being characterized by recurrent exacerbations with intervals of comparative freedom. In addition to the above symptoms, pain is almost constantly present in these cases, and it usually locates itself in such a way as to clearly indicate the position which the

[1] "Diseases of the Throat and Nasal Passages," New York, 1879, p. 617.

[2] Liverpool Med. and Surg. Reporter, October, 1870.

foreign body has assumed in the air passages. If the body is in the larynx, the pain is naturally located in that region; if, on the other hand, it is in the air passages below, the patient usually refers the most marked symptoms of pain to the front wall of the chest immediately over the location of the object. This pain also radiates in a less degree to the posterior wall of the chest.

Hemorrhage is not ordinarily a prominent symptom, yet in the following case, which came under my own observation, this was the prominent feature of the affection:

J. A. D., aged 38, a lawyer, presented the following history: He had suffered from a slight irritating cough, without expectoration, for some time back. On the 17th of August, 1888, he was seized with hæmoptysis, which lasted some hours, in which he lost perhaps four ounces of blood. This had recurred several times since in small quantities. It was clear arterial blood with no mucus or froth. Examination failed to detect any morbid condition of the lungs or upper air tract. I saw him subsequently a number of times during an attack of hæmoptysis, and discovered the bright, clear arterial blood coating the walls of the trachea. No treatment seemed to be of any service, nor did a visit to Southern California improve the condition. During the summer of 1889 he coughed up an irregular calcareous mass about the size and shape of a tooth, with complete relief to all symptoms. This had undoubtedly been the source of all his trouble, and its presence in the bronchus gave rise practically to no symptom other than the recurrent hemorrhages which during the latter part of its sojourn became quite frequent.

DIAGNOSIS.—The history of the case ordinarily will establish the character of the accident; in the absence of any such history, we have no means of definitely determining the existence of a foreign body in the breathing-passages, except in those cases in which its lodgement is in the larynx or trachea, when it can be brought under ocular inspection by the use of the laryngoscope. Digital exploration, of course, is only of value when the object is in the larynx.

The main interest in this connection has to do with the location of a foreign body which has passed into the bronchi. In most instances the right bronchus is invaded on account of its anatomical position. The subjective symptoms, especially that of pain, as before noticed, will of course aid us in locating the object. Also auscultation may detect its immediate location by the peculiar harsh or sonorous râle which results from the air passing in respiration, provided the tube is not completely occluded. If the latter condition exists, we are compelled to depend largely on the absence of the respiratory murmur in that portion of the lung supplied by the occluded bronchus. Cohen[1] makes the note that obstruction of the left bronchus causes an absence of respiratory murmur over

[1] Ashhurst's "International Encyclop. of Surgery," New York, 1883, vol. v., p. 267.

the entire left lung, while occlusion of the right bronchus usually produces absence of the respiratory murmur over the lower lobe alone of that side; the division of that bronchus taking place much nearer the bifurcation, and foreign bodies rarely lodging above the point of division.

In the case of a foreign body in one of the bronchi giving rise to symptoms closely resembling pulmonary phthisis, and without a previous history of its entering the passages, the question of diagnosis becomes one of no little difficulty. A unilateral bronchitis with recurrent exacerbations and muco-purulent expectoration tinged with blood, accompanied by progressive loss of flesh and hectic fever, ought certainly to suggest the possible presence of a foreign body as the cause of the symptoms, especially if an examination of the sputa fails to detect the tubercular bacillus.

PROGNOSIS.—The entrance of a foreign body into the air passages is to be regarded as an accident of an exceedingly grave character, and presents a very serious menace to life, either from the immediate symptoms which arise, or from the secondary morbid processes which are liable to develop in the air passages.

Immediately upon the entrance of a foreign body into the air tract, nature endeavors to expel it by the instant cough and other reflex movements which are set in play. In the very large majority of instances this is successful. In a somewhat elaborate analysis of 1,000 cases collated by Weist, 338 were operated upon by laryngotomy or tracheotomy, 599 were not operated upon, and in 63 the foreign body was removed by digital manipulation or the forceps. Of the 599 not operated upon, 139 died, while 460 recovered: of this latter number the body was expelled by coughing in 412, by vomiting in 26, by sneezing in 5, by fall in 5, by inversion of the body in 6, while in the remaining 6 the particular method of expulsion is not given. This voluntary expulsion occurred in from one to thirty days in 276 cases, and after a month in 184; of the 338 which were operated upon by tracheotomy, 245 recovered. We thus find that 72.5% recovered after operation, while about 77% recovered without an operation. Coming now to the 139 deaths without operation, 84 of these died of asphyxia, 33 of pneumonia, 4 of exhaustion, 10 of abscess, 5 of laryngitis, and 3 of consumption.

Durham[2] reports 271 cases of foreign bodies in the air passages which were not operated upon. Of these, 156 recovered, or 57.5%, and 115 died, or 42.5%. Out of 435 cases of foreign bodies in the air passages treated by operative methods, 328 recovered, or 75.4%.

[1] Trans. Amer. Surg. Ass'n, vol. i., p. 117.

[2] Holmes' "System of Surgery," Amer. ed., vol. i., pp. 709 and 714.

Gross[1] reports 85 cases in which no operation was performed; of these, 56 recovered and 29 died. In the 56 recoveries there were included 3 cases in which emetics were used and 4 in which inversion was practised, while of the 29 fatal cases 8 died after spontaneous expulsion. Of 98 cases in which the air passages were opened, 83 recovered and 15 died.

Combining these statistics of Gross, Durham, and Weist, we have 1,674 cases. An analysis of these shows that without operation death occurred in 28.6%, and in 25% after operation. Of course the idea is not intended to be conveyed that the results in the operative and non-operative cases are to be compared, in that, as we have seen, a large percentage of the non-operative cases died before relief could be afforded.

There seems to be no limit to the time in which voluntary expulsion may take place; thus, in Durham's cases[2] this occurred on the first day in 6, in from one to eight days in 12, from eight to thirty days in 19, from thirty days to a year in 68, and in from one to seventeen years in 31: while Gross[3] reports an instance in which a piece of bone was expelled after sixty years' retention. This cannot be received, however, as an argument in favor of an expectant course of treatment, for there can be no question as to the propriety of extracting these substances at the earliest period possible, whether with or without operative procedure; and furthermore, even after the expulsion of the body the danger to life has not been removed; thus, of Gross' 29 non-operative fatal cases, 8 died after the expulsion of the foreign body.

TREATMENT.—Our first effort in any given case should be directed toward ascertaining the character and location of the foreign body with which we have to deal. The history of the case will usually give information as regards its character, while its location can usually be determined by the subjective symptoms, the character and extent of the dyspnœa, and the vocal impairment, if such be present, with the aid of digital exploration and laryngoscopic examination.

After the acute manifestations have subsided, such as choking, spasm, etc., as they usually do in the course of a few minutes, the gravity of the situation can be determined by the symptoms which remain. If the dyspnœa is of such a character as to threaten suffocation, of course immediate resort should be had to operative interference. If, however, the symptoms are not urgent, an effort should be made to secure the expulsion of the foreign body through the natural passages.

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[1] "Foreign Bodies in the Air Passages," Phila., 1854.

[2] Loc. cit. [3] Op. cit.

The administration of sternutatories and emetics dates back to the early days of medicine, the object being to excite a violent expiratory effort. It is exceedingly doubtful if any good is accomplished in this way, in that much more can be hoped for by a well-directed and intelligent voluntary expiratory effort than the involuntary movements excited in this manner. The patient should be directed to take a slow, deliberate, and full inspiration, after which the air is to be forced out violently, in the hope of dislodging the substance. This manipulation is aided in no small degree by violent blows upon the chest at the time of the expulsive effort. An additional aid is also secured by inverting the body. This is best done in the manner so successfully resorted to by Padley[1] for the removal of a coin from the windpipe. The patient sat with his knees flexed over the elevated end of a strong bench, when

FIG. 88.—Cusco's Laryngeal Forceps.

upon lying down on his back the coin fell into the mouth. The advantage of the supine position over the prone is that, in case of the body lodging against the rima glottidis, the spasm which would ensue is avoided by the quick recovery of the erect position. The comparative value of these measures is fairly indicated in the statistics of Weist, already given. Most writers seem to think that there is a certain amount of danger attendant upon the attempt to secure the expulsion of a foreign body by position, owing to the risk of its becoming impacted in the chink of the glottis. On this ground Weist is of the opinion that it should never be practised without previously opening the air passages. I am disposed to think the danger greatly overestimated, and it certainly is very largely eliminated by Padley's ingenious plan, with reference to smooth, round bodies. If we have to do, however, with bodies of irregular shape and sharp edges, this danger must be kept in view, whatever manipulations are resorted to.

In case of failure of the above methods, our subsequent resort

[1] British Medical Journal, Nov. 6th, 1878, p. 721.

is to the use of forceps and other instruments for extraction in those instances in which the foreign body lies in the larynx. This is probably only available where the substance lies above the glottis. This is accomplished either with the aid of the laryngoscopic mirror or the index finger inserted into the larynx. The choice of an instrument, of course, will depend on the character and location of the body. In most cases probably the Cusco forceps (see Fig. 88), on account of the firmness of grasp and freedom of play of the blades, will answer better purposes. Figs. 89 and 90 illustrate an interesting case reported by Grazzi,[1] in which a horizontal grasp was necessary for the extraction of a coin from the laryngeal ventricle. Gruening[2] makes the suggestion that, in a case where there is danger of the body becoming dislodged in the larynx and dropping into the trachea during the manipulation, preliminary tracheotomy should be performed. In the case of

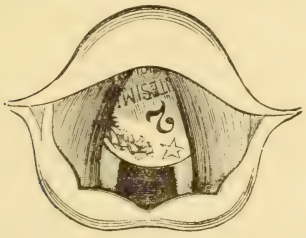

FIG. 89.—Coin in Laryngeal Ventricle (Grazzi).

FIG. 90.—Coin in Grasp of Forceps, showing Method of Removal employed in Grazzi's Case.

jagged bodies, the danger of injury to the soft parts, by which permanent vocal impairment may result, is always to be borne in mind, and it occasionally may seem wiser to crush such substances as nutshells, pieces of bone, etc., as was done in the case reported by Mackenzie,[3] rather than to lacerate the tissues in their extraction. In case the impaction is the result of localized swelling, of course it may seem wiser to await the subsidence of this. The ingenuity of the physician in devising the special method in any given instance is illustrated in a case reported by Brandeis, who extracted a thread from the larynx by means of a brush dipped in mucilage.

These operations through the natural passages in adults are very easily accomplished without anæsthesia. In children, however, it will become necessary in most instances to administer an anæsthetic, not only to secure proper control of the patient, but

[1] Boll. delle Mal. dell' Orecchio, etc., 1884, No. 4.
[2] New York Med. Record, vol. xxi., p. 584.
[3] Pathological Transactions, vol. xviii., p. 27.
[4] American Practitioner, Nov., 1873, p. 317.

also tolerance of the passages. In a case reported by Jurasz,[1] while the patient, a child only 22 months old, was completely anæsthetized, he failed to get a laryngoscopic inspection; upon coming out from the influence of the anæsthetic, the child began to cry; when this occurred, the laryngeal inspection was secured and the foreign body extracted. Laryngoscopy in young children during anæsthesia is by no means an easy matter in all cases. In such a case the index finger in the larynx not only serves to explore the cavity, but also acts as a guide to the forceps, as in a case reported by Major[2] in a child eleven months old, and by Krishaber[3] in a girl of nine years.

In case of failure of the above methods or where the dyspnœic symptoms are urgent, a resort to tracheotomy becomes necessary. This may be done to relieve the dyspnœa due to the impaction of a foreign body in the larynx; to secure access to such body; to secure better access to the lower air passages, or in rare instances as a precautionary measure in the manner already alluded to. As a rule, the indications are for a low tracheotomy, although it may be occasionally necessary, in order to obtain access to a substance in the laryngeal cavity, to perform high tracheotomy, or a cricothyrotomy, or even a thyrotomy; even in those cases in which it becomes necessary to open directly into the larynx, it is probably wiser to first perform the low tracheotomy. Lateral pharyngotomy as done by Wheeler[4] for the removal of a needle in the arytenoid, and subhyoidian pharyngotomy as done by Lefferts[5] for the extraction of a watch ring embedded in the ary-epiglottic fold, are somewhat unique procedures.

After the performance of tracheotomy, the further manipulation necessary for the extraction of a foreign body in the larynx will depend mainly on its character and location. It may then be extracted by manipulation through the mouth, or instruments may be inserted through the tracheal opening and the object forced into the oral cavity. When the operation is done for a foreign body in the trachea or bronchi, it is not infrequently expelled immediately upon opening the trachea, or it may be forced up so near to the tracheal opening as to enable the surgeon to seize it with the forceps.

Failing this, it may become necessary to resort to the supine position, or succussion of the body, in order to detach it from the

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[1] Monatschr. für Ohrenheilkunde, 1886, No. 12.
[2] Canada Med. and Surg. Jour., May, 1887.
[3] Annal. des Mal. de l'Oreille, May 10th, 1878.
[4] Medical Press and Circular, April 22d, 1875.
[5] New York Med. Record, Dec. 15th, 1874.

parts below and enable it to be forced up near to the tracheal opening. In the celebrated case of Brunel,[1] the great English engineer, a half-sovereign, which had made its way into the windpipe, was not expelled until seventeen days after tracheotomy, when it was dislodged by inversion and succussion and made its exit into the mouth. In case of failure of tracheotomy to bring the object within reach by the simpler manipulations, it is to be sought for by probes and forceps passed directly down into the trachea.

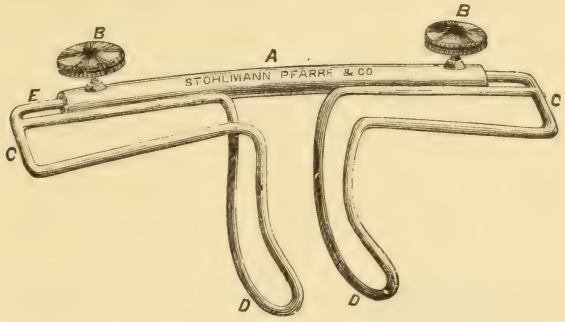

FIG. 91.—Minor's Tracheal Retractor.

In order to obtain free access to the tracheal cavity for subsequent manipulation, the edges of the incision should be held as widely apart as possible by proper instruments. For this purpose we may use Labord's dilator or Minor's retractor (see. Fig. 91), or better still, perhaps, threads should be inserted into the tracheal rings and the parts held open in this manner. In a case reported by Wyeth,[2] the edge of the tracheal wound was stitched to the integument, thus securing a permanent opening for subsequent ex-

FIG. 92.—Gross' Tracheal Forceps.

ploration, the first having failed. In this manner also a patulous opening for the expulsion of the body is secured in case of its subsequent dislodgement.

The exploration of the trachea may be done either with the finger, or with a long slender probe bent at right angles, although a better process probably consists in using the forceps for exploratory purposes. Gross used a long, flexible forceps constructed of German silver, similar to those shown in Fig. 92. Cohen has de-

[1] Journal de Malgaigne, 1845. [2] New York Medical Record, vol. xxvi., p. 552.

vised a pair of shouldered forceps for this purpose. Jacobson[1] reports the successful use of Stoerk's laryngeal-tube forceps, a most admirable device, in that the tube, being constructed of German silver, can be easily bent to a proper angle. Seiler's tube forceps (see Fig. 93) also serves an excellent purpose. If the foreign body be a small, jagged object, such as a nutshell or piece of bone, it will often be quite sufficient simply to disengage it from the soft parts. This can be done by a slender silver probe, with the end bent into the form of a hook. After dislodgement, it is usually easily expelled.

Of course, after the trachea is opened, still further inspection may be made by means of reflected light, a small mirror being inserted into the wound. It is scarcely necessary to add that the powerful rays of the sun should always be used in such a case, as affording the best illumination.

The insertion of the finger into the trachea for the purposes of

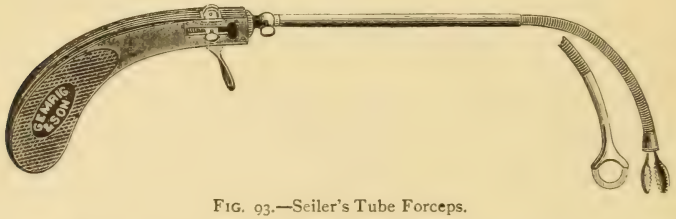

FIG. 93.—Seiler's Tube Forceps.

locating or even dislodging a foreign body is always available, in that the bifurcation can easily be reached in this manner.

The strength and endurance of the patient should never be taxed by too-prolonged efforts at exploration and extraction of a foreign body immediately following the performance of tracheotomy, in that the procedure can be postponed to the next day, or even for a week, without involving any additional danger to the patient. Gross advises that not more than three attempts of one minute each should be employed. Moreover, after the windpipe is opened, dislodgement and voluntary expulsion can be anticipated at some future time. In view of this, it is scarcely necessary to add that the tracheal opening should not be occluded by the insertion of a tube, as in such a case the expulsion of a foreign body would thus be interfered with. In case it becomes necessary to postpone the attempt to a later period, the wisest procedure would be to stitch the edge of the tracheal wound to the integument, as was done by Wyeth.

The presence of a foreign body in the bronchus having been

[1] New York Med. Record, vol. xxii., p. 733.

demonstrated and its extraction after tracheotomy having been unsuccessful, it becomes a question of no little moment as to what further measures are justifiable. It is always to be borne in mind that after tracheotomy the dislodgement and expulsion of the substance is more liable to occur than before the operation. Furthermore, prolonged instrumentation and experimental efforts at extraction are exceedingly liable to set up grave morbid processes, by which the life of the patient may be placed in serious danger. An expectant plan of treatment, therefore, after the tracheotomy, for a while at least, is the wisest procedure in those cases where the presence of a foreign body in the bronchus gives rise to no immediately dangerous symptoms. If, however, further interference becomes imperative, and only in such a case, is the resort to the operation recommended by Nesiloff,[1] for exposing the bronchi, warranted. This operation was originally proposed for the extraction of a neoplasm in the mediastinum, but is also available for reaching the bronchial tubes without opening the pleural cavity. The patient, being placed on his abdomen, a vertical incision is made three inches to the left of the median line and extending from the third to the sixth dorsal vertebra. From each extremity of the vertical incision two horizontal incisions are carried toward the vertebræ. The flap is then raised, uncovering the third, fourth, fifth, and sixth ribs, which are then cut through, upon which subperiosteal excision is made. The pleura is then pushed forward, and the bronchus searched for at the bottom of the wound. I know of no instance in which this operation has been done for this purpose, but Willard,[2] in discussing the subject, concludes that the risks from thoracotomy and bronchotomy following unsuccessful tracheotomy are much greater than the dangers incurred by permitting the foreign body to remain. McBurney,[3] in discussing the subject, makes the shrewd suggestion that, considering the angle at which the left bronchus passes into the trachea, an incision might be made into the right side of the trachea, in such a locality as will afford direct access to this tube.

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[1] Annals of Surgery, vol. iii., p. 308.

[2] American Journal of Medical Sciences, Dec., 1891, p. 578.

[3] New York Med. Jour., 1891, vol. liv., p. 639.

CHAPTER XLII.

FRACTURE OF THE LARYNX.

THIS is an accident which is usually the consequence of a fall, a direct blow, or pressure on the organ, and may result in the fracture of a single cartilage, or two or more may be involved in the injury. It usually gives rise to symptoms of rather serious import, and is generally regarded as an exceedingly rare occurrence; thus, Hunt[1] in 1866 was able to collate but 29 cases, while two years later Henocque[2] made a collation of but 52 cases; and yet, curiously enough, Lane[3] makes the assertion that he has found either an existing fracture, or evidence of its having previously occurred, in nine per cent of cases examined in the dissecting-room. It is difficult to understand this statement, unless possibly many of these fractures occurred after death, as the result of the rude handling of the cadaver.

ETIOLOGY.—The direct cause of the accident may be either a fall from a height upon some projecting object, or it may result from a flying missile. In a number of instances the injury has been inflicted by a bullet. It also occurs in the act of garrotting or hanging, and during personal encounters, either from a blow of the fist or from compression in the act of choking an antagonist. Sajous[4] reports the case of a man aged thirty-one in whom muscular action seems to have caused the fracture. Sajous discovered crepitation in the larynx somewhat accidentally. He attributed it to a violent attack of coughing two years before, the patient remembering that at the time "something gave way" in the larynx. The accident gave rise to no subjective symptoms, however.

It is generally stated that the ossification which the cartilages undergo with advancing years renders one more liable to this injury, and therefore that it is more liable to occur in persons in adult life; yet a large majority of the cases which have been reported have occurred during the third, fourth, and fifth decades of

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[1] Amer. Jour. Med. Sciences, vol. li., p. 378.

[2] Gaz. Hebdom., 1868, 2d ser., vol. v., pp. 610, 625.

[3] Trans. Path. Soc., London, 1884–85, vol. xxxvi., p. 82.

[4] Med. and Surg. Reporter, Phila., 1883, vol. xlviii., p. 62.

life, while seven instances have been observed in which the accident occurred in the first decade; thus, Atlee[1] reports a case as occurring at the age of four; Hume,[2] one at six; Liston,[3] one at eight; while Gibb[4] and Eichmann[5] each report two cases occurring in children under nine.

SYMPTOMATOLOGY.—The first result of the accident usually is an external deformity, which consists in a sinking in of the laryngeal prominence in the neck, unless the injury is the result of lateral compression, in which case an undue prominence is liable to occur. The injury to the soft parts gives rise to more or less extensive external tumefaction, which may be either the direct result of the blow or it may be due to an emphysematous infiltration of the tissues where the fracture extends completely through the lining membrane of the larynx. In Hume's case this subcutaneous emphysema, in a child of six, diffused itself over the whole body from the head to the feet. The internal injury necessarily causes rupture of the blood-vessels, and hence dyspnœa very early becomes a prominent symptom, either from the escape of blood into the air passages or into the submucous tissues. The prominent subjective symptoms, therefore, become dyspnœa, with the expectoration of frothy mucus, more or less tinged with blood. The dyspnœic symptoms may set in immediately upon the occurrence of the accident, or they may be delayed for some days; thus, in a case observed by Manby,[6] a man aged sixty-four, dyspnœa did not set in till the fourth day; while in one observed by Bell,[7] a man aged twenty-five, dyspnœic symptoms did not occur until the seventh day after the accident. The voice, of course, is either impaired or completely lost. Cough is usually present, with pain on deglutition. The essential and almost pathognomonic symptoms are, however, the dyspnœa and bloody sputa.

As regards the cartilages involved, Durham's[8] report shows fracture of the thyroid alone in 24, of the cricoid in 11, of the thyroid and cricoid in 9, of the thyroid, cricoid, and trachea in 2, of the cricoid and trachea in 2, of the thyroid and hyoid in 4, of the thyroid, cricoid, and hyoid in 2, of the cricoid, trachea, and hyoid in 1, while in 7 the exact location is not given.

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[1] Amer. Jour. Med. Sciences, Jan., 1858, p. 120.
[2] Lancet, London, 1882, vol. i., p. 987.
[3] Edinburgh Med. Jour., Oct., 1823, vol. xix., p. 570.
[4] Cited by Frédet: Gaz. des Hôp., 1868, vol. xii., pp. 358, 363.
[5] Cited by Hunt: Loc. cit.
[6] Lancet, London, 1886, vol. i., p. 63.
[7] Ibid., 1876, vol. ii., p. 571.
[8] Holmes' "System of Surgery," Amer. ed., Phila., 1881, vol. i., p. 697.

The accident may result in a simple linear fracture, or it may be comminuted, and even compound.

DIAGNOSIS.—The clinical history of the case, together with the evidence of external injury, the flattening of the laryngeal prominence, with the bloody sputa and dyspnœa, if present, constitute symptoms sufficiently characteristic, and render it a comparatively easy matter to recognize the nature of the accident. In addition to this, palpation of the parts enables one to recognize the deformity and the presence of emphysema by its peculiar crackling sound, and also in most cases the crepitation between the fragments. Laryngoscopic examination will show the distortion of the laryngeal cavity, with submucous extravasation, or the escape of blood into the air passages, as the case may be.

PROGNOSIS.—The accident is to be regarded as one of no little gravity; this varies, however, somewhat according to the special cartilages involved. Thus, if the thyroid cartilage alone is the seat of fracture, the danger is much diminished; while cases in which the cricoid ring is crushed are generally regarded as almost invariably fatal. Durham, in his analysis, found that of fracture of the thyroid alone there were 24 cases and 18 deaths; of the cricoid alone, 11 cases and 11 deaths; of the thyroid and hyoid, 4 cases and 2 deaths; of the thyroid and cricoid, 9 cases and 9 deaths; of the thyroid, cricoid, and hyoid, 2 cases and 2 deaths; of the thyroid, cricoid, and trachea, 2 cases and 2 deaths; of the cricoid and trachea, 2 cases and 2 deaths; of the cricoid, trachea, and hyoid, 1 case and 1 death; and of the 7 cases in which the seat of injury was not designated there were 3 deaths. We thus find that in 62 cases there were 12 recoveries; in 6 of these, the thyroid alone was involved, in 2 the thyroid and hyoid, and in 4 the seat of injury was not recorded.

The injury gives rise to immediate laryngeal obstruction, either from displacement of the fragments or from subcutaneous extravasation, and, secondarily, either from the occurrence of acute inflammation or œdema; while subsequently, if the patient survives, a somewhat prolonged suppurative process is liable to ensue. Furthermore, the emphysema may extend into the peri-laryngeal or peri-tracheal tissues, or even as far down as the mediastinum, as in Hunt's case, in which death occurred six hours after the accident. The fatal termination, therefore, may result either from suffocation or the subsequent development of pneumonia, pleurisy, pulmonary œdema, mediastinal abscess, septicæmia, or some other complicating disorder.

TREATMENT.—As soon as the accident is recognized, efforts should be made to control such inflammatory action as may de-

velop, by means of counter-irritants, leeching, and cold dressings. If there is any displacement of the parts, they should be restored as far as possible by external manipulation, and held in place by light strips of adhesive plaster, while at the same time all movement in the larynx is controlled as far as practicable by not only the avoidance of the use of the voice, but of any attempt at deglutition, food being administered by the rectum if necessary, or by means of a tube. The gravest danger which is threatened, of course, is in the development of dyspnœic symptoms, and hence the case must be watched with the greatest care, and preparations made for the performance of tracheotomy as soon as any evidence of laryngeal stenosis manifests itself. The canula should be inserted as low down as possible, for we are by no means able in all cases to determine how far the traumatism has extended; thus, in a case reported by Berry,[1] the fracture was comminuted, and the insertion of a tracheal canula gave no relief to the dyspnœic symptoms. On post-mortem examination, one of the fragments was found hanging in the trachea below the tube, suspended by a slender strip of mucous membrane.

As soon as any apprehension in regard to dyspnœa has been allayed, either by the subsidence of the local inflammatory process or by the insertion of a tube, attention is to be directed toward the restoration of the parts to their normal position and the preservation of laryngeal function. If a tracheal canula is in position, this will be accomplished either by the manipulation of a probe in the larynx or by the insertion of bougies, or possibly thyrotomy may be demanded to obtain access to the larynx for the restoration of the parts or the removal of projecting fragments.

If the patient survive the injury, the subsequent cicatrization may result in such a narrowing of the larynx as to render the permanent wearing of the tube a necessity, as in Sawyer's case.[2] In such an event, the best results in treatment will probably be obtained by resort to intubation, as was successfully done in a case reported by Simpson.[3] The tube used in this case was not the ordinary intubation tube, but a conical instrument, by which dilation was accomplished.

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[1] Lancet, London, 1885, vol. i., p. 936.

[2] Amer. Jour. Med. Sciences, January, 1856.

[3] Paper read before New York Acad. of Med., Feb. 18th, 1892.

CHAPTER XLIII.

PROLAPSE OF THE LARYNGEAL VENTRICLES.

THE mucous membrane of the larynx, after it is reflected over the ventricular band, passes outward to the inner face of the thyroid cartilage, to which it is firmly attached, and then returns again, passing over the vocal cord, thus forming the ventricle of the larynx. The possibility of this pouch-like cavity becoming prolapsed would seem to be an accident scarcely to be anticipated, and yet its occurrence is placed beyond question by a number of well-authenticated cases. It was first demonstrated by its accidental discovery by Moxon,[1] in the post-mortem examination of a man who died of cancer of the stomach, no notable laryngeal symptoms having been present during life. The case referred to by Mackenzie[2] seems also to have only been discovered after death. The first to recognize the condition during life was Lefferts,[3] who reports the case of a man who presented with a history of aphonia, with slowly progressive dyspnœa, dating back two years. This was found to be due to a complete prolapse of the left ventricle, which presented an ovoid fleshy mass overlapping the vocal cord, while on the right side there was a partial prolapse. Thyrotomy was performed, and the mass on the left side excised and found to be the laryngeal ventricle. Other instances have been recognized during life and reported by Cohen,[4] Elsberg,[5] and Semon,[6] who each saw one case; Major[7] and Gouggenheim,[8] who each report five cases; Jellenfy,[9] who reports four cases; and Przedborski,[10] who reports two cases, one of which, however, is doubtful. In Cohen's case the accident seems to have occurred suddenly during a violent attack of coughing; in most of the cases, however, the prolapse seems to have been a gradual development, the clinical histories dating back from twelve to twenty-four months and even longer.

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[1] Trans Path. Soc. London, 1868, vol. xix., p. 65.

[2] "Laryngeal Growths," Amer. ed., Phila., 1871, p. 34.

[3] Medical Record, New York, June 3d, 1876, p. 359.

[4] Arch. of Laryngol., vol. iii., p. 66.

[5] Ibid., p. 67.

[6] St. Thomas' Hospital Reports, vol. xiii., p. 168.

[7] Trans. Amer. Laryngol. Ass'n, 1886, p. 117.

[8] Internat. Congress for Laryngol. and Otology, Paris, 1889. Internat. Centralblatt für Laryngol., vol. vii., p. 127.

[9] Wien. med. Woch., 1887, p. 1325.

[10] Gazeta lekarska, 1889.

The only direct cause assigned for the accident is in the violence to which the tissues are subjected during the act of coughing. How this operates it is not easy to understand. I think we must presuppose a relaxed condition of the mucous membrane. It is possible that the violent act of coughing may result in the severing of the attachments of the thyro-arytenoid muscle, and with it the attachment of the mucous membrane lining the ventricle; this, of course, however, is purely speculative.

In three of Major's cases there was tuberculosis, and in two syphilitic disease, while four of Gouggenheim's cases were tubercular; Przedborski's case, also, was tubercular.

The symptoms to which the affection gives rise are either impairment or complete loss of voice, and, where the tumefaction has attained sufficient proportions, as in Lefferts' case, a moderate amount of dyspnœa is present. The interesting point, of course, lies in the question of diagnosis, which at best must be somewhat difficult. The tumor presents as a rounded or somewhat spindle-shaped mass, smooth in contour, of a pale pinkish tinge, or slightly injected, which lies directly upon the vocal cord, and seems to emerge from the ventricular fissure. It is regular in outline, soft in consistency, and easily indented by means of a probe. It should not be confused with a fibroid, which is a hard, dense tumor, irregularly nodulated and not pedunculated; moreover, fibroid tumors never arise from the laryngeal ventricle. The long clinical history of the disease, together with the absence of ulceration or glandular involvement, should be considered in the elimination of a possible malignant origin of the growth.

In dealing with these cases, a certain amount can be accomplished by means of local astringents in reducing the size of the tumefaction. Successful replacement cannot be hoped for. Complete restoration of the vocal function can only be anticipated by treating the affection as a neoplasm and removing it. This may be done either by means of the snare manipulated through the natural passages, or, failing this, by performing thyrotomy, as was successfully done in Lefferts' case, in which there was complete relief of all symptoms, with restoration of voice. Jellenfy, regarding the affection as a sort of incarcerated hernia, endeavored in several of his cases to shut off the circulation by a series of superficial incisions over its contour, thus successfully reducing the prolapse.

CHAPTER XLIV.

BENIGN TUMORS OF THE LARYNX.

THE important place which the consideration of benign tumors of the larynx has occupied in the literature of throat diseases during the past thirty years and more would carry the suggestion that this form of disease possesses a clinical significance of unusual importance, and that the development of a laryngeal growth is to be regarded as a matter of no little gravity. Thus, Fauvel,[1] in his voluminous work, devotes nearly seven hundred pages to the consideration of benign neoplasms, reporting in detail 300 cases which he had observed, while exhaustive monographs on the same subject have been contributed by Von Bruns,[2] who reported 40 cases; Elsberg,[3] who reported 13 cases; Mackenzie,[4] who reported 100 cases of his own, with 189 others collated from medical literature; Stoerk,[5] who published 36 cases; while personal observations of series of cases have been contributed by Schnitzler,[6] who recorded 35 cases; Oertel,[7] who recorded 68 cases; Schroetter,[8] who recorded 84 cases; Tobold,[9] who recorded 200 cases; Hopmann,[10] who reported 25 cases; and Boecker,[11] who recorded 40 operations.

Notwithstanding the extensive literature of the subject, and the exhaustiveness with which it has been studied, I am disposed to think that its importance is somewhat overestimated, in that, as will be seen further on, I do not regard the existence of a benign tumor in the larynx as constituting a condition of serious gravity, or as involving any especial danger to life. In most instances it exhausts its capacity for mischief, in impairing a function which is not vital, viz., that of phonation. An undue importance, I think, attaches in the minds of the laity always to any impairment of the vocal

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[1] "Traité Pratique des Mal. du Larynx," Paris, 1876.

[2] "Die Laryngoskopie," Tübingen, 1865. "Polypen des Kehlkopfes," Tübingen, 1868. [3] "Morbid Growths within the Larynx," Phila., 1866.

[4] "Growths in the Larynx," London, 1871.

[5] "Laryngoscop. Operationen," Vienna, 1871 and 1872.

[6] Wien. med. Presse, 1874. [7] Deutsches Arch. für klin. Med., 1875.

[8] Laryngol. Mittheilungen; Jahresbericht der Klinik für Laryng., Wien, 1875.

[9] "Laryngoscopie und Kehlkopfkrankheiten," Berlin, 1874.

[10] Deutsches Arch. für klin. Med., 1876. [11] Deutsche med. Woch., 1876, No. 34.

function. Where the cause of this impairment is discovered to lie in the existence of a tumor in the larynx, the apprehension and alarm are naturally very greatly increased, and yet in most instances the condition is not essentially one of danger, and is mainly serious in those cases in which the occupation is dependent on a normal condition of the vocal apparatus, as is the case with singers, public speakers, and others. I do not wish to be understood as in any way underestimating the importance of benign growths and their treatment. I know of nothing finer in medical literature than the record of the brilliant success attained by Fauvel, Mackenzie, and others in successfully dealing with the long series of cases of laryngeal growths which they report, at a time when the laryngoscope was a comparatively new invention, and when that nice manipulative skill which an endo-laryngeal operation demands could only be of recent acquirement.

The development, progress, and symptoms of the various benign neoplasms of the larynx are practically identical, and hence it will be found more convenient to discuss them collectively rather than to devote a separate section to each variety, differentiating only where it seems necessary, as in the discussion of pathology and diagnosis.

The varieties of tumors which are met with in the larynx, from a clinical point of view, in the order of frequency, are: *Papillomata*, *fibromata*, *cystomata*, *myxomata*, *adenomata*, *lipomata*, *angiomata*, *enchondromata*, and *mixed tumors*.

ETIOLOGY.—It is exceedingly difficult, in any given case, to assign a definite active or predisposing cause for the development of a laryngeal neoplasm. It is usually stated that a hyperæmia of the mucous membrane, or perhaps a catarrhal inflammation, is the most active cause of the affection, and yet undoubtedly a large majority of the cases develop in a previously healthy larynx; certainly, in most of the cases which have come under my own observation not only was it difficult to discover any existing inflammatory affection to account for the disease, but the presence of the growth itself failed to excite any morbid process in the surrounding tissues. Traumatism, in the form of laryngeal strain, or over-exertion of the voice, is undoubtedly to be regarded as a not infrequent cause of the disease. This seems to be quite clearly demonstrated by Browne,[1] who directly traces 13 of the 25 cases which he reports to over-use of the voice in professional singers, actors, etc. Of Mackenzie's[2] 100 cases, but 21 were traceable to this cause. Fauvel's[3] 300 cases also occurred with greatest frequency among those whose vocations demanded the especial use of the voice, al-

[1] "The Throat and Nose and their Diseases," 3d ed., London, 1890, p. 450.

[2] Op. cit., p. 16.

[3] Op. cit., p. 197 *et seq.*

though he finds, as active causes, exposure to cold, the inhalation of irritating vapors, eruptive fevers, etc. A very curious observation is made by this same observer, who reports several instances of warty growths in the larynx, occurring in individuals who were subject to what he calls the "papillomatous diathesis," [1] as shown by the existence of warty growths in other portions of the body.

Syphilis and tuberculosis are by many regarded as the cause of laryngeal growths. These diseases in the larynx often assume the vegetative form, as is shown by the wart-like excrescences which develop usually on the anterior face of the arytenoid commissure, and more rarely in other portions of the organ, especially in tubercular disease. These vegetations should be regarded as local manifestations of the constitutional taint rather than as distinct tumors.

That the normal functional activity in the larynx is not necessary for the production of a neoplasm is shown by the curious case recorded by Mackenzie,[2] where a laryngeal tumor was observed in a deaf-mute.

The disease belongs essentially to adult life. Of Fauvel's[3] 300 cases, 5 occurred in the first decade of life, 7 in the second, 60 in the third, 118 in the fourth, 79 in the fifth, 24 in the sixth, while 7 occurred in individuals over sixty years of age. Mackenzie's[4] statistics are somewhat similar, 6 occurring in the first decade, 6 in the second, 21 in the third, 22 in the fourth, 28 in the fifth, 14 in the sixth, and 3 in the seventh. Two of these occurred before the age of five. The oldest case I find recorded is one of Schiffer's,[5] at 82.

The great preponderance of cases occurring in males would seem to lend weight to the view that catarrhal inflammation is an active cause of the affection. Thus, of Fauvel's cases, 231 were males and 69 females, while of Mackenzie's own and collated cases 197 were males and 90 females. Schwartz,[6] out of 585 collated cases, found 426 in males and 159 in females.

While growths in early life, especially of the papillomatous variety, are not rare, Causit[7] is probably incorrect in the statement that they are most frequent in early infancy. Thus, of 44 cases which he collated, he was of the opinion that 10 were congenital.

While the congenital origin of the disease is probably not so frequent as Causit seemed to think, yet a number of well-authenticated cases have been observed. Thus, Dufours[8] reports having

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[1] Op. cit., p. 200.
[2] Op. cit., case 37, appendix D.
[3] Op. cit., p. 197.
[4] Op. cit., p. 15.
[5] Cited by Moure, "Leçons sur les Mal. du Larynx," Paris, 1890, p. 396.
[6] "Les Tumeurs du Larynx," Paris, 1886.
[7] "Étude sur les Polypes du Larynx chez les Enfants," Paris, 1867.
[8] Arch. générales de Méd., Paris, 1867, vol. i., p. 273.

seen two cases, one of which is somewhat doubtful, while in the other the congenital origin is unquestioned. This was the case of a child born with aphonia, and which subsequently developed dyspnœa. These symptoms continuing for twelve months, death ensued, and a post-mortem examination revealed the existence of a laryngeal papilloma. A similar case was observed by Causit,[1] in which the child survived two and a half years. Edis[2] reports the case of a child dying thirty-seven hours after birth, from suffocation, in which a post-mortem examination revealed the presence of a cyst the size of a large bean, springing from the lateral wall of the larynx, and occluding the rima glottidis. Mackenzie has seen three congenital cases: his first[3] was that of a child, aphonic from birth, and slightly dyspnœic, which died in an epileptic fit in its fourth year. The post-mortem revealed the existence of a papilloma in the larynx. His second case[4] was that of a child, who died from suffocation, at two and a half years of age, as the result also of a papillomatous growth in the larynx. His third case[5] was that of a young lady who came under his observation at the age of 23, having been aphonic from birth. An examination showed a papillomatous growth attached to both vocal cords, and producing the appearance of a web-like adhesion, involving the anterior half of the glottis. This was successfully removed, and the voice completely restored. Abercrombie[6] reports a case almost identical with that of Edis, in which death occurred on the fourteenth day. Gottstein[7] reports the case of a boy seven years of age, suffering from papilloma of the larynx, which the symptoms clearly indicated as congenital. It was successfully treated by means of the snare. Five cases, also, have been reported by H. A. Johnson:[8] in his first case, a child died from suffocation at the end of ten weeks. In his second, a child sixteen months old, suffering with hoarseness and dyspnœa from birth, expelled a papillomatous growth in a paroxysm of whooping-cough, resulting in apparently a complete cure. In his third case, tracheotomy was done at the end of three years, and thyrotomy at the end of the fourth year, the child finally dying of pneumonia. In his fourth case, a papillomatous growth in a child necessitated tracheotomy, and death resulted the following day.

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[1] Gaz. des Hôp., vol. xxxix., p. 225.
[2] Trans. of the Obstetrical Soc. London, 1876, vol. xviii., p. 22.
[3] Trans. Path. Soc. London, vol. xvi., p. 37.
[4] Brit. Med. Jour., 1870, vol. ii., p. 36.
[5] Trans. Path. Soc. London, 1874, vol. xxv., p. 35.
[6] Trans. Path. Soc. London, vol. xxxii., p. 33.
[7] Wien. med. Woch., 1868, p. 1696.
[8] Arch. of Laryngology, 1883, vol. iv., p. 244.

The fifth case was very similar, the child also dying the day following tracheotomy, the larynx being found to be filled with papillomatous growths. A similar case is reported by Lennox Browne[1] of a child aged three, upon whom intubation was unsuccessfully attempted, and tracheotomy was finally done, death following forty hours later.

SYMPTOMATOLOGY.—A benign tumor in the larynx makes its presence known mainly by its interference with the function of phonation, and in rarer instances with that of respiration. Impairment of voice is almost the constant attendant of these growths, in that in the majority of instances they are situated either upon the vocal cords or so near to them that they interfere with their free vibration. Thus, in Mackenzie's 100 cases[2] the voice was impaired in 92 instances, being completely lost in 55, and simply hoarse in 37; while in 52 this was the only symptom present. Fauvel,[3] on the other hand, found the voice affected in every instance in 300 cases. This is somewhat curious, in that it is easy to understand how a sessile growth in the ary-epiglottic folds or epiglottis, or even in the ventricular bands, might develop without producing any notable impairment in the pitch or quality of the voice. While the ordinary conversational voice is not impaired, its volume and strength is necessarily somewhat affected, according to the size of the growth; and even though this may be very small, the voice is liable to be weak and tires easily, even after moderate usage, whether the tumor be located upon the cord or in other portions of the larynx.

The morbid condition, being confined to the larynx, very rarely gives rise to reflex disturbances; we can easily understand, therefore, how the presence of a growth, even though it may be attended with a certain amount of hyperæmia of the mucous membrane, rarely gives rise to cough. In Fauvel's 300 cases this symptom was present in but 6.

Interference with respiration, of course, is directly dependent upon the size of the growth, and to a certain extent upon its location as encroaching upon the chink of the glottis. As a rule, where dyspnœa exists, it is more marked during the act of inspiration than in expiration, in that a growth lying upon the cords is often lifted up, as it were, by the expiratory current, whereas in inspiration it falls over the rima glottidis in such a way as to markedly interfere with the entrance of air to the lungs. Where the growth is sessile, and immovable, of course the dyspnœa, if present, occurs with both inspiration and expiration.

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[1] Brit. Med. Jour., 1889, vol. i., p. 530.

[2] "Diseases of the Throat and Nose," Amer. ed., Phila., 1880, vol. i., p. 305.

[3] Op. cit.

Spasmodic contraction of the muscles of the larynx occasionally occurs from the presence of the growth; this is especially true in young children. Pedunculated growths, whose favorite point of origin is near the anterior commissure of the vocal cords, will oftentimes give rise to dyspnœa when they fall below the glottis, which is completely relieved when they are blown out, as it were, upon the superior surface of the cords.

A catarrhal laryngitis, excited by the presence of a growth, while somewhat rare in adults, is very common in young children. As the result of this condition, nocturnal exacerbations of dyspnœa become a frequent accompaniment of the disease.

Hemorrhage is an exceedingly rare symptom, although where a papilloma is located near the vocal cords, and is subjected to attrition in the movements of the parts, its surface may become eroded, and the sputa be tinged with blood. A severe hemorrhage would point rather to malignancy in the growth.

Pain is rarely, if ever, present, although a sense of fulness about the parts, and perhaps a little uneasiness on pressure, may be occasionally experienced. This, however, is only where the growth has attained a considerable size.

Fauvel[1] reports a somewhat curious symptom in nearly a fourth of his cases, viz., a certain perversion of the sense of taste, with excessive secretion of saliva. No reasonable explanation of this can be suggested.

PATHOLOGY.—The pathological characteristics of laryngeal neoplasms will necessarily be considered under separate heads.

Papillomata.—This form of neoplasm occurs more frequently than all other varieties together; thus, of 1,100 cases collated by Bruns, 602, or 54%, were papillomata, while 67% of Mackenzie's and 69% of Fauvel's cases were of the same character. Elsberg[2] reports having observed 310 cases of growths in the larynx, 163 of which were papillomata. This is the form of growth to which Virchow applies the term "pachydermia verrucosa," in contradistinction to "pachydermia diffusa," already described in the chapter on Chronic Laryngitis.

The essential morbid changes which characterize the two forms of the disease commence in the papillæ of the mucosa, giving rise to certain hypertrophic changes, which in the diffuse form of the disease expend themselves largely in the deeper tissues, without extending to the superficial layers of the mucous membrane or epithelial structures. In the former variety, viz., the pachydermia verrucosa or papillomata, the changes which take place not only involve

[1] Op. cit., p. 210.

[2] Arch. of Laryngol., New York, 1880, vol. i., p. 1.

the papillæ of the mucosa, but also extend to the epithelial structures on the surface. The activity of the process here, however, is found in the epithelium, rather than in the mucosa. The process also limits itself to a circumscribed area. In this manner, therefore, we have a localized efflorescence or proliferation of epithelial cells, which pile themselves up in such a manner as to produce practically a wart-like growth on the surface. The peculiarity of the process lies in the fact that the epithelial cells which are generated in such excess, instead of losing their vitality, and becoming desquamated, pile themselves up on the surface, and remain an integral part of the tissue.

The surface of a papillomatous growth is marked by numberless small rounded projections, each one of which probably marks the site of an individual papilla in the normal mucous membrane. If a longitudinal section be made through one of these papillary projections, there will be found occupying its centre the elongated papilla containing the original vascular loop, supported by loose connective tissue, and the whole surrounded by from fifteen to twenty layers of epithelial cells, the proportion which the original papilla bears to the whole mass of epithelial cells being exceedingly small.

These growths, in the large majority of instances, are situated upon the vocal cords, and usually in the anterior portion of the larynx. In rarer cases, they are found upon the ventricular bands, the ary-epiglottic folds, and the epiglottis. It is somewhat curious that they never develop upon the arytenoid commissure, a point where, on account of the constant motion to which the parts are subjected, we might naturally suppose warty growths would occur. This fact carries with it a certain clinical significance, in that a growth locating itself on the posterior portion of the cord, or on the commissure, naturally excites a suspicion of malignancy.

As a rule, a papilloma is sessile in character, though occasionally pedunculated. It may occur singly or in groups, and varies in size from a millet-seed to a growth more or less completely filling the supra-glottic laryngeal cavity.

Their rapidity of development depends largely on the age of the patient. Thus, in adult life the progress of the case is somewhat slow, while in childhood they develop with considerable rapidity. Their increase in bulk is at the same time accompanied with a broadening of their base, by the involvement of neighboring papillæ.

As a rule, they confine themselves to the supra-glottic portion of the larynx in adult life, although in children they occasionally extend below the cords. Indeed, this is true of all forms of benign

tumors of the larynx. Thus, Fauvel,[1] in his 300 cases, met with but 9 instances of subglottic growths.

Fibromata.—This form of growth occurs next in frequency to the papillomata, and constitutes from eight to ten per cent of all cases observed.

It belongs essentially to adult life. Thus, of Mackenzie's eleven cases, the youngest occurred at twenty-seven and the oldest at fifty-seven.

In composition it does not differ essentially from similar growths met with in other portions of the body. It is practically composed of masses of interlacing fibres of connective tissue, containing within their meshes a limited number of branching cells. It is scantily supplied with blood-vessels, but is covered with a mucous membrane showing notable evidences of hyperæmia, which extends also beyond the limits of the growth, forming a well-marked areola.

It is usually sessile in form. A pedunculated fibroma is an exceedingly rare event, and it is probable that many cases which have been recorded as pedunculated growths of this variety were really cystic in character.

The favorite site for the development of a fibroma is in one of the vocal cords. Occasionally the development of a fibroma in one cord gives rise to a similar growth on the opposite side. Aside from this, multiple development does not occur.

They present as small, rounded growths, varying in size from a millet-seed to a hazel-nut, though Summerbrodt[2] and Von Ziemssen[3] report instances in which the growth almost completely filled the supra-glottic larynx. In the latter case, the tumor sprang from the upper border of the cricoid cartilage. They present a smooth, rounded outline, except in those cases in which the growth is multi-lobular.

That this is a somewhat rare form of neoplasm in the larynx seems to be indicated by the fact that, in addition to the reports of Bruns, Fauvel, Mackenzie, Schwartz, and others, already referred to, the only cases recorded in general literature, up to a comparatively recent date, are those by Michel,[4] Morgan,[5] Schaeffer,[6] Seiler,[7] Charles Knight,[8] and Summerbrodt.[9] And yet at the present day, perhaps, an ordinary laryngeal fibroid would not possess sufficient clinical interest to warrant its publication. The case reported by

[1] Op. cit., p. 195.
[2] Berl. klin. Woch., 1876, vol. xiii., p. 563.
[3] "Cyclop. of the Practice of Med.," Amer. ed., vol. vii., p. 887.
[4] Berliner klin. Woch., 1872, vol. ix., p. 96. Zeit. für Chir., 1873–74, vol. iv., pp. 456 and 459.
[5] Maryland Med. Journal, 1884, vol. x., p. 531.
[6] Monat. für Ohrenheilk., 1879, vol. xiii., p. 6.
[7] Med. Times, Philadelphia, 1875–76, vol. vi., p. 435.
[8] New York Medical Record, vol. xxix., p. 314.
[9] Loc. cit.

Summerbrodt is especially interesting, in that an epilepsy of some years' standing, which had resisted all treatment, was arrested by the removal of the growth in the larynx.

Cystomata.—Up to comparatively recent times, this form of neoplasm was considered to be exceedingly rare. Thus, but one per cent of Fauvel's[1] cases were of this variety, while Mackenzie cites but two cases of his own, and two among his collated reports. In 1880, however, papers on this subject were presented by Cervesato[2] and Moure,[3] the former reporting 85 cases and the latter 92 observed and collated cases. The inference would seem to be that this form of neoplasm had either been completely overlooked or, more probably, its character mistaken, in that it is undoubtedly of quite frequent occurrence. Indeed, Moure[4] is of the opinion that it is the most common of all benign growths in the larynx, with the exception of papillomata.

This form of tumor also belongs to adult life, usually occurring between twenty-five and fifty. The youngest case reported was fourteen, and the oldest sixty-four.[5]

A cystoma seems to be primarily the result of an obstruction of the duct of one of the muciparous glands, under the influence of which its secretion becomes imprisoned, and, slowly increasing in amount, distends the cavity of the gland in such a way that it pouches above the surface of the membrane, forming a minute bag. As secretion still continues within the occluded gland, the small sac protrudes from and finally develops into a projection on the surface, which, however, rarely becomes thoroughly pedunculated in character. This is the view usually entertained in regard to the development of a cystoma, although whether it is due to a degeneration of the epithelial lining of the gland, and an atrophy of the duct, as taught by Robin,[6] or is the result of certain degenerative changes in the epithelial cells themselves, the duct remaining patent, as taught by Billroth,[7] is uncertain.

As regards the site of its development, Moure,[8] in a collation of 117 cases, finds its origin upon the epiglottis in 50, on the vocal cords in 45, in the ventricles of Morgagni in 8, upon the arytenoid cartilages in 4, the ary-epiglottic folds in 3, the cartilages of Santorini in 1, and the ventricular bands in 2. In 4 cases the origin of the growth was unknown.

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[1] Op. cit., p. 198.

[2] Comptes rendus du premier Congrès international de Laryngol., Milan, 1882.

[3] Rev. mens. de Laryngol., 1881, vol. i., p. 75 *et seq.*

[4] Op. cit., p. 408.

[5] Bruns: "Die Laryngosk. und die laryngosk. Chir.," Tübingen, 1863, p. 63.

[6] Gaz. des. Hôpit., 1852, p. 46.

[7] "Ueber den Bau der Schleimpolypen," Berlin, 1855.

[8] Revue mens. de Laryngol., 1882, vol. ii., p. 228.

It presents as a smooth, rounded, easily compressible, movable mass, covered with light red mucous membrane, and varies in size from the head of a pin to a hazel-nut.

Myxomata.—This form of tumor is met with somewhat rarely, for, although Fauvel[1] reports 53 of his 300 cases to have been of this nature, I am disposed to think that there must have been some uncertainty as to the true pathological character of the growths, in that Mackenzie, in his 100 cases, met with but a single instance, and with but one other in his 189 collated cases. Moreover, since Fauvel published his work, I find but few cases reported in literature: thus 3 cases were observed by Michel,[2] 2 by Moure,[3] and 1 each by Bruns,[4] Mackenzie,[5] Cohen,[6] Sidlo,[7] King,[8] Eeman,[9] Schmidt,[10] and Tauber.[11]

These growths locate themselves invariably upon the vocal cords, and may consist in a myxomatous degeneration, as it were, of the mucous membrane, giving rise to a sessile growth, as occurred in one of Moure's cases, or they may assume the form of a pedunculated multi-lobular growth, as occurred in Mackenzie's and Cohen's and another of Moure's cases. In some instances, they seem to present the ordinary smooth surface and gelatinous aspect of the myxomatous tumors met with in other parts of the air tract, while in others the surface is mammillated, of a grayish-pink color, and closely resembles a papilloma, from which indeed they can only be distinguished by microscopic examination.

In most cases they are unilateral, although both cords may be invaded.

Pathologically they are identical with similar growths in other portions of the air tract, being composed of loosely interlacing fibres of connective tissue holding within its meshes branching myxomatous cells.

Angiomata.—Vascular tumors in the larynx have been observed by Fauvel,[12] Mackenzie,[13] Coupard,[14] Kidd,[15] Ferreri,[16] Elsberg,[17] Wol-

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[1] Op. cit., p. 198.

[2] Berlin. klin. Woch., 1872, vol. ix., p. 942. Zeit. für Chir., 1873–74, vol. iv., pp. 454 and 458.

[3] Revue mens. de Laryngol., 1886, vol. vi., pp. 2 and 6.

[4] "Polypen des Kehlkopfes," Tübingen, 1868, p. 17.

[5] "Laryngeal Growths," Amer. ed., Phila., 1871, p. 198.

[6] Trans. Path. Soc. Phila., vol. iv., p. 151.

[7] Med. Jahrbuch, Wien, 1870, vol. xx., p. 147.

[8] Canadian Practitioner, 1886, p. 365.

[9] Revue mens. de Laryngol., 1886, vol. vi., p. 7.

[10] Personal communication to Eeman: Loc. cit., p. 8.

[11] Ibid. Loc. cit.

[12] Op. cit., pp. 545 and 606.

[13] Op. cit., p. 188.

[14] Revue mens. de Laryngol., 1880–81, vol. i., p. 311.

[15] British Med. Jour., 1888, vol. i., p. 584.

[16] Lo Sperimentale, Dec., 1888.

[17] New York Med. Record, vol. xxv., p. 21. Archives of Medicine, 1884.

fenden,[1] Schwartz,[2] Desvernine,[3] Seiler,[4] Heinze,[5] Johnson,[6] Glasgow,[7] Knight,[8] and Hooper.[9]

In the majority of cases, they spring from the vocal cord, although instances have been recorded where their origin was from the ventricular bands, the epiglottis, the hyoid fossa and the lingual sinus. They vary in size from a pea to a hazel-nut, and are composed, as are similar tumors in other regions, of a mass of blood-vessels held together by loose bands of connective tissue. The cases reported have all occurred in adult life, and confined themselves to one side, except in Wolfenden's case, where the growth was bilateral.

Chondromata.—Instances of this form of growth have been observed by MacIlvain,[10] Ryland,[11] Ashhurst,[12] Asch,[13] Froriep,[14] Virchow,[15] Stoerk,[16] Türck,[17] Ehrendorfer,[18] Eppinger,[19] Boecker,[20] Bruns,[21] Bertoye,[22] Porter,[23] and Ingals.[24]

It is characteristic of a cartilaginous growth springing from one of the laryngeal cartilages, that it extends inward, giving rise to a sessile and immovable mass, which attains a considerable size, thus encroaching notably upon the breathing space, and causing dyspnœic symptoms. Its favorite point of development is in the cricoid cartilage, a large proportion of the cases having this origin: next in the order of frequency it arises from the thyroid, the epiglottis, and the arytenoid cartilages.

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[1] Jour. of Laryngol., 1888, vol. ii., p. 291.
[2] "Des Tumeurs du Larynx," Paris, 1886, pp. 32 and 33.
[3] Revista de Ciencias Medicas, 1888.
[4] Trans. Amer. Laryngol. Ass'n, 1884, p. 65.
[5] Arch. of Laryngol., 1880, vol. i., p. 134.
[6] Trans. Medico-Chirurgical Soc., vol. li., case 3.
[7] Amer. Jour. Med. Sciences, 1888, vol. xcvii., p. 360.
[8] Boston Med. and Surg. Jour., 1876, vol. xciv., p. 20.
[9] Trans. Amer. Laryngol. Ass'n, 1884, p. 63.
[10] Edinburgh Med. and Surg. Jour., 1831, vol. xxxv., p. 215.
[11] "Diseases of the Larynx," 1835, p. 226.
[12] Medical Record, New York, 1882, vol. xxi., p. 233.
[13] Trans. Amer. Laryngol. Ass'n, 1884, p. 66.
[14] Preuss. Vereinszeit., 1834, No. 38. Schmidt's Jahrb., Bd. vii., 1835.
[15] "Die krankhaften Geschwülste," vol. ii., p. 438.
[16] "Klinik der Krankheiten. des Kehlkopfes," 1880, p. 417.
[17] "Klinik der Krankheiten des Kehlkopfes," p. 317.
[18] Arch. für klin. Chir., 1881, vol. xxvi., p. 578.
[19] Klebs' "Handbuch. der path. Anat." "Path. Anat. der Larynx und Trachea," Bd. ii., 1ste Abtheil., 1ste Lief., p. 237.
[20] Deutsche med. Woch., 1886. p. 749.
[21] "Beiträge zur klin. Chir.," 1887, vol. iii., p. 341.
[22] Annal. des Mal. de l'Oreille, 1886, vol. xii., p. 125.
[23] Amer. Jour. Med. Sciences, 1879, n. s., vol. lxxvii., p. 393.
[24] Trans. Amer. Laryngol. Ass'n, 1888, p. 126.

They are usually sessile in character, irregular in outline, and covered with slightly hyperæmic mucous membrane, and, where subjected to attrition, the surface becomes eroded. They occur usually in adult life, and develop very slowly. They are composed purely of hyaline cartilage, excepting where they spring from the epiglottis, when there is a more or less copious admixture of fibrous tissue. In one of Boecker's cases, a patient aged sixty-two, the tumor had undergone a certain amount of ossification. They vary from the size of a cherry-pit to a mass more or less completely filling the laryngeal cavity.

Adenomata.—It is somewhat doubtful if this form of neoplasm ever occurs in the larynx. Fauvel, in his 300 cases, met with none. Mackenzie regards one of his cases as of this character, although the microscopic examination showed it to be adenoid cancer. Two have been observed by Massei, although he considered the diagnosis questionable. Additional instances have been reported by Bruns,[2] and Hérard and Cornil.[3] Schwartz,[4] however, is disposed to regard the diagnosis of these cases as open to question, taking the ground that adenomata never occur in the larynx.

Lipomata.—The development of fatty tumors in the larynx is confined, with the single exception of a case reported by Bruns,[5] to those cases which, taking their origin in the ary-epiglottic fold, fall externally into the hyoid fossa, where they oftentimes attain considerable size. Instances of this form of neoplasm have been reported by Holt,[6] Jones,[7] and Macleod.[8] Holt's case was a man aged eighty, in whom the tumor was pedunculated, and had existed twelve years, extending down into the œsophagus. This patient died from suffocation, the tumor being expelled from the œsophagus, and lodging upon the entrance to the larynx. In Jones' case, the tumor formed a round, pedunculated mass two inches in diameter, which was easily enucleated through the natural passages. In Macleod's case, the tumor attained the size of an orange, and necessitated lateral pharyngotomy, the patient dying subsequently from hemorrhage. In Bruns' case, the growth was intralaryngeal, occurring in a female aged twenty-five, and was supposed to have been congenital. It attained considerable size, entirely occluding the orifice of the larynx. The larger part of it was removed by the galvano-cautery, in fifteen séances.

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[1] "Sui Neoplasmi laringei." "Studii e casuistica," Napoli, 1885.

[2] "Polypen des Kehlkopfes," Tübingen, 1868, p. 30.

[3] Cited by Krishaber: "Dict. Encyclop. des Sciences médicales," Paris, 1868, article "Laryngoscope."

[4] "Des Tumeurs du Larynx," Paris, 1886.

[5] Op. cit., p. 84.

[6] Trans. of the Path. Soc. of London, vol. v., p. 123.

[7] Ibid., vol. xxxii., p. 243.

[8] Glasgow Med. Jour., 1880, vol. xiii., pp. 240 and 242.

Histologically, these tumors differ in no essential degree from growths of the same character met with elsewhere. It is to be understood that in describing, as above, the various forms of neoplasm which occur in the larynx, we have described them under the head of the prevailing histological element which enters into their composition. Growths in the larynx, however, follow the same rule which governs the development of tumors in other parts of the body, and we not infrequently meet with cases, in which other tissues are more or less copiously mingled with the prevailing type.

DIAGNOSIS.—To a trained ear, the peculiar character of the voice not infrequently will suggest the existence of a neoplasm in the larynx, although certain diagnosis is necessarily based on a laryngoscopic examination, which not only reveals the size and

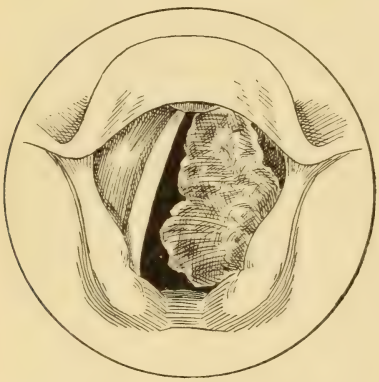

FIG. 94.—Papilloma of Right Ventricular Band.

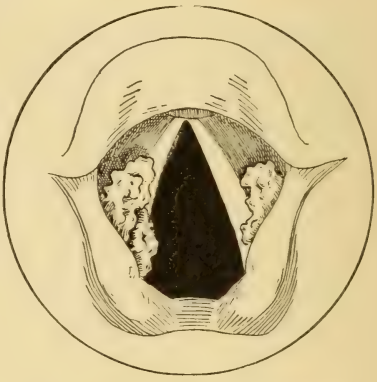

FIG. 95.—Papilloma of Ventricular Bands.

location of the growth, but in many instances will enable the examiner to form a fairly correct estimate as to the character of the growth with which he has to deal.

A *papilloma* is soft in consistency, is movable to a limited extent in the acts of inspiration and phonation, presents a grayish-white or pinkish-white color, is minutely mammillated or wart-like in contour, and usually springs from the anterior portion or angle of the vocal cords. The only growth with which it need be confounded, probably, is epithelioma in its early stages, and here the age of the patient will aid us in forming a correct opinion, in that the benign growth is more apt to occur in the early periods of life.

A *fibroma* presents the appearance of a hard, resisting mass, with a rounded or irregularly nodulated contour, and is covered with a mucous membrane, more or less highly injected. It is usually sessile in character, and deeply embedded in the surrounding tissues. It springs almost invariably from the anterior portion of

the vocal cords. It differs in gross appearance from a myxoma, although it may resemble either a cystoma or chondroma. The latter, however, never develops upon the vocal cords, while the cystoma is soft, compressible, usually movable, and liable to be pedunculated. It, moreover, presents a semi-translucent aspect. A gummy tumor of the cords might present appearances suggestive of fibroma, and yet the progress and clinical history of the former should aid in establishing the diagnosis.

A *cystoma* is a small, soft, compressible growth, usually pedunculated, of a pinkish-white or grayish-white color, according to its location. Thus, on the cords it usually forms an almost translucent sac, while when it springs from the parts above, as from the arytenoid commissure or epiglottis, its surface is more or less vascular, giving it a reddish tinge, rendering it somewhat opaque.

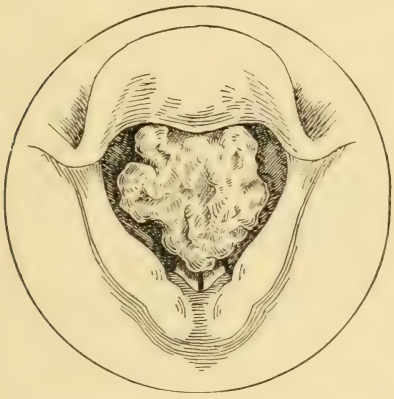

FIG. 96.—Papilloma of Ventricular Band completely filling the Vestibule of the Larynx.

FIG. 97.—Cystoma of the Epiglottis.

The character of the growth is easily determined by the probe, or by its collapse on seizure with the forceps.

A *chondroma* presents a hard, dense, resisting mass, of somewhat irregular outline, whose prominent characteristic is its exceeding slowness of development. It is covered by a healthy mucous membrane, and arises from any one of the laryngeal cartilages, although the cricoid is its favorite seat. In this latter situation it may be mistaken for a perichondritis or carcinoma. The former disease is characterized by the suddenness of its onset, the acuteness of the local inflammatory symptoms, and the early development of dyspnœa, while the subglottic origin of carcinoma is an exceedingly rare event. Moreover, the benign growth belongs to the earlier periods of life. A chondroma from one of the cartilages above the glottis, presents something of the gross appearance of a fibroma. Its origin gathered from the clinical history, should

suggest the character of the growth. Of course, the density of the tumor would easily distinguish it from the softer neoplasms, such as myxoma and cystoma.

Myxoma.—Myxoma in the larynx is of soft consistency and a grayish-white color, and practically presents appearances not unlike those of myxomatous tumors of the nasal cavity, especially where the growth is broadly sessile. Where, however, it is multiple, as in cases reported by Mackenzie, Cohen, and others, it presents appearances not unlike that of a papilloma. In these instances, the diagnosis can only be clearly established by removing a portion of the tumor, and subjecting it to microscopic examination. The growth, moreover, as in papilloma, arises almost invariably from the vocal cords, Vanderpoel's[1] case of myxoma springing from the epiglottis forming a somewhat rare exception.

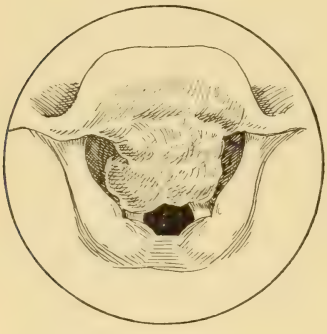

FIG. 98.—Chondroma of the Epiglottis.

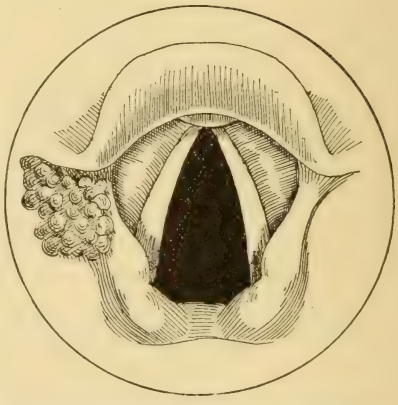

FIG. 99.—Angioma of the Left Ary-Epiglottic Fold.

Angioma.—Angioma, constituting, as it does, a raspberry-like mass of highly injected blood-vessels, presents gross appearances which are so unmistakable that an error in diagnosis cannot easily be made.

PROGNOSIS.—As before intimated, these growths, as a rule, involve no dangers to life, except in those instances in which they attain such size as to encroach upon the normal breathing space; and in such a case, of course, a fatal tendency can be counteracted by the prompt performance of tracheotomy. When dyspnœa results from the presence of a growth, its development is always so slowly progressive that ample warning is conveyed of any dangerous tendencies.

Papillomata develop more rapidly than any other form of laryngeal neoplasm; especially is this true in very young children,

[1] Trans. of the Amer. Laryngol. Ass'n, 1890.

and yet even here the dyspnœic symptoms rarely, if ever, involve sudden danger from suffocation.

As a rule, the presence of the growth gives rise to no marked disturbance of the other portions of the larynx, either of an inflammatory or a neurotic character; and although a laryngitis or spasm of the glottis may set in, I recall no case in which this has proved an especially grave complication. This same can be said of œdema of the glottis.

With our present methods of dealing with a neoplasm of the larynx, by the endo-laryngeal and extra-laryngeal operations, the prognosis as regards cure is practically always good. Of the various forms of tumors enumerated, papillomata alone show a marked tendency to recurrence. This is probably, in most instances, if not in all, due to the fact that this variety of growth is generally subjected to the endo-laryngeal method of removal; hence, in those cases in which they have attained considerable size, it requires exceedingly nice manipulative skill to thoroughly extirpate the neoplasm without injury to the soft parts. It is probable, therefore, that the failure to thoroughly extirpate the growth is in no small degree responsible for the recurrence when it takes place.

The prognosis as regards the complete restoration of the voice is generally good, although in some cases, where the tumor has attained a large size, its extirpation is attended with a certain amount of injury to the healthy tissues, which is liable to permanently impair the voice.

Although the spontaneous expulsion of the growth is not a result to be anticipated, instances of this have been reported by Causit,[1] Dobie,[2] Gibb,[3] Türck,[4] Charazac,[5] and Moure.[6]

The possibility of a benign neoplasm undergoing malignant degeneration has recently been the subject of somewhat extended investigation, it having been claimed that a spontaneous tendency to this degeneration existed, which was notably stimulated by the endo-laryngeal methods of operating. Semon[7] has definitely settled this question, by a most painstaking and exhaustive collation of cases from general literature and personal observation, the results of which were published in a series of articles in his journal. In 2,531 cases of benign neoplasms of the larynx which were not operated upon, malignant degeneration took place in 12, or 1 in

[1] "Études sur les Polypes du Larynx," Paris, 1867, p. 33.

[2] Amer. Jour. Med. Sciences, 1853.

[3] Trans. Path. Soc. London, 1862–63, vol. xiv., p. 39.

[4] "Krankheiten des Kehlkopfes," Wien, 1866, p. 305.

[5] Jour. of Laryngol., 1887, vol. i., p. 435.

[6] "Leçons sur les Maladies du Larynx," Paris, 1890, pp. 419 and 420.

[7] Internat. Centralblatt für Laryngol., Rhinol., etc., vols. v. and vi

every 211 cases; while of 8,216 cases operated upon, degeneration took place after operation in 33, or in the proportion of 1 to 249 cases. It is thus found that, not only is the tendency to spontaneous degeneration an exceedingly feeble one, but that this tendency is diminished rather than enhanced by operative interference. It is scarcely necessary to add that this tendency largely confines itself to papillomatous growths, although Semon, in his statistics, embraced all forms of neoplasms.

TREATMENT.—Before the days of laryngoscopy, practically the only method of dealing with a neoplasm in the larynx, in those rare cases in which it was recognized, consisted in obtaining access to the laryngeal cavity by an external opening through the neck,

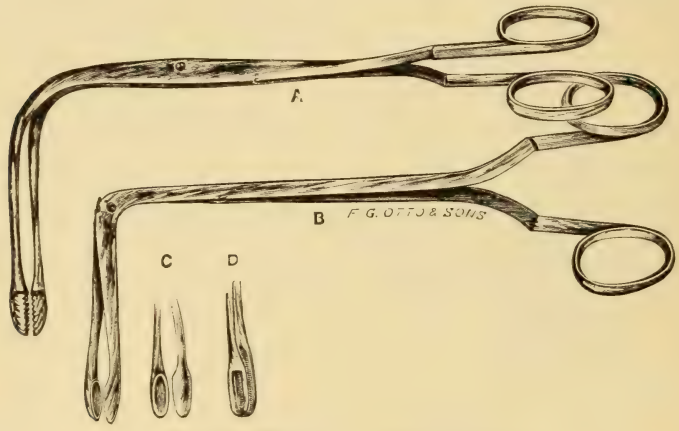

FIG. 100.—Mackenzie's Laryngeal Forceps.

although instances of successful operation through the natural passages, previous to the introduction of the laryngoscope, have been reported by Koderik,[1] Middledorf,[2] Green[3] and Regnoli,[4] the latter operating after performing tracheotomy. These were all cases in which the growth attained considerable size, and was easily discovered by external palpation or inspection.

After the larynx was brought under ocular inspection, the recognition of growths, even of small size, of course became not only an exceedingly simple procedure, but also, curiously enough, very common.

The ability to examine the larynx naturally suggested the feasibility, in all cases, of operating through the natural passages, and few chapters in medical literature are more creditable than those

[1] Cited by Lewin: Deutsche Klinik, March 29th, 1862.
[2] "Die Galvanocaustik," Breslau, 1854.
[3] "Polypi of the Larynx and Œdema of the Glottis," New York, 1852.
[4] "Osservazione Chirurg.," etc., Pisa, 1836.

which record the great manipulative skill which was early acquired for, and the striking success which attended, these endo-laryngeal operations.

The methods employed for the extirpation of a neoplasm may be enumerated as evulsion, crushing, abscission by means of knives or scissors, écrasement, and the use of the chemical or potential cautery.

Evulsion consists in seizing the growth bodily, and tearing it from its site. This is accomplished either by means of the bladed forceps or what is called the tube forceps. In Fig. 100 is shown the Mackenzie blade forceps, in which the blades are bent at a right angle. They are constructed to work either antero-posteriorly or laterally. Fauvel's forceps are very similar, with the exception that the blades are curved to a segment of a circle. My own preference is decidedly in favor of the Mackenzie instrument, owing to the fact that the angle at which it is bent adds notably to the facility of manipulation. As regards the direction of the blades, I quite agree with Fauvel in regarding the lateral movement as oftentimes of considerable advantage, in that the view of the parts is less obstructed than in the antero-posterior movement; the blades of Fauvel's instrument, moreover,

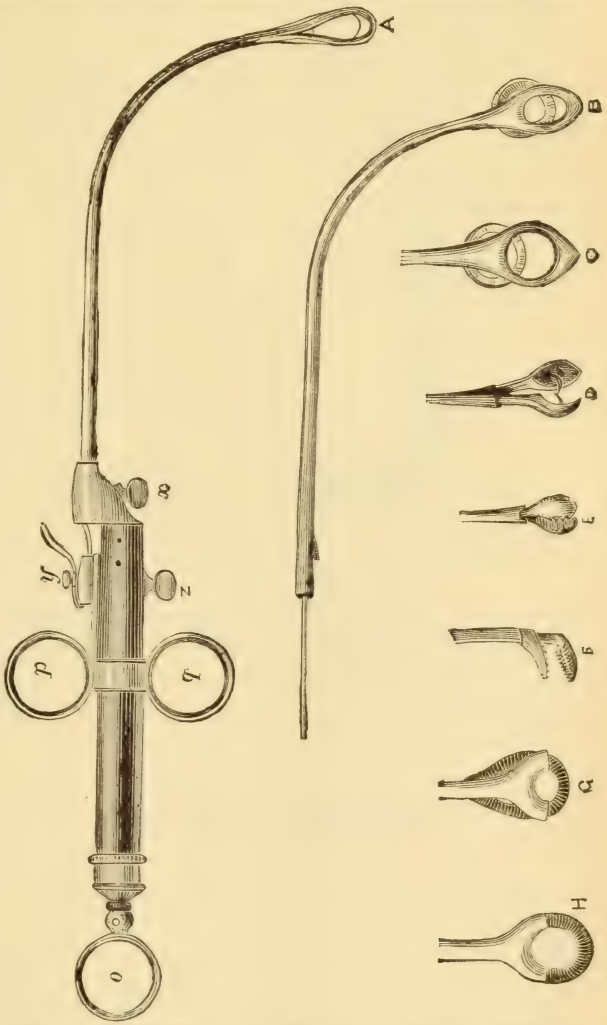

FIG. 101.—Stoerk's Forceps. *A*, Wire écraseur; *B* and *C*, guillotines; *D*, *E*, and *F*, forceps; *G*, guillotine half closed; *H*, the same open.

are fenestrated for the same reason. As accomplishing the same purpose, various forms of tube forceps have been devised, the mechanism of which will be easily understood by the illustrations given. The objection to these instruments, as a rule, I think, is that they are not only too delicate in construction, but that the movements of

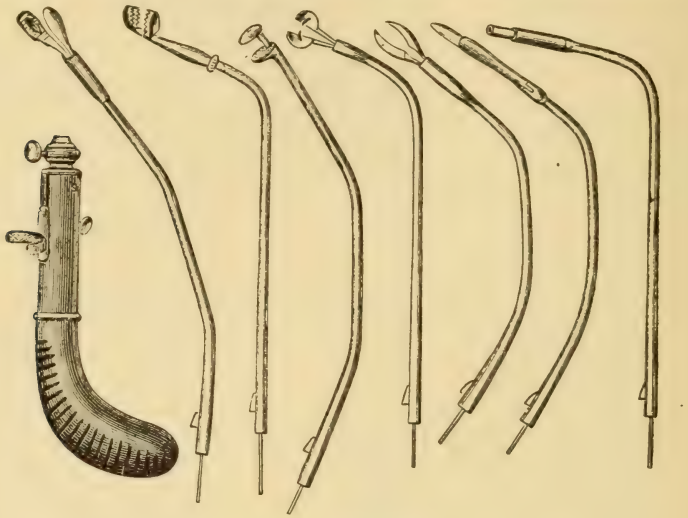

FIG. 102.—Schroetter's Forceps, with Concealed Knives and Applicator.

the blades are somewhat limited, restricting their use to the smaller growths. The types of these are fairly well illustrated by Stoerk's instrument, shown in Fig. 101, in which the distal extremity of the tube is bent to the quadrant of a circle; and in Schroetter's instru-

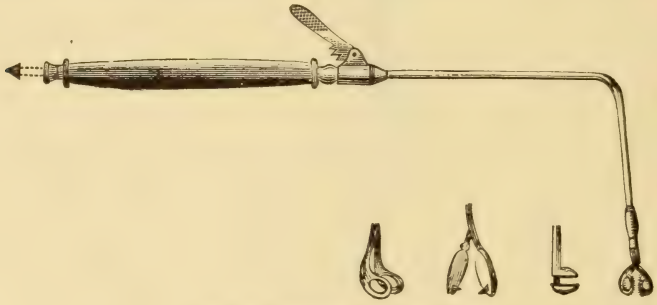

FIG. 103.—Mackenzie's Tube Forceps.

ment, shown in Fig. 102, in which the tube is curved, both horizontally and vertically, in such a way that the handle is thrown to one side and beyond the line of vision. The latter instrument I regard as by far preferable for convenience of manipulation, although its use is somewhat restricted. The Mackenzie tube forceps, shown in Fig. 103, I regard as entirely too slender for ordinary use; while

Gottstein's instrument, shown in Fig. 104, does not, I think, admit of nice manipulation.

Crushing the growths is accomplished by the same instruments which are used for evulsion.

Abscission consists in cutting through the base of the growth by means of a concealed knife or small scissors such as those shown as parts of the Stoerk and Schroetter instruments.

Écrasement is only adapted for those growths which project into the lumen of the larynx, in such a way as will admit of the successful placing of a wire loop around their base. For this purpose, Schroetter's instrument or any ordinary snare may be used, the distal extremity being bent to a proper curve to suit the individual case.

The indications for excision by means of the guillotine, such

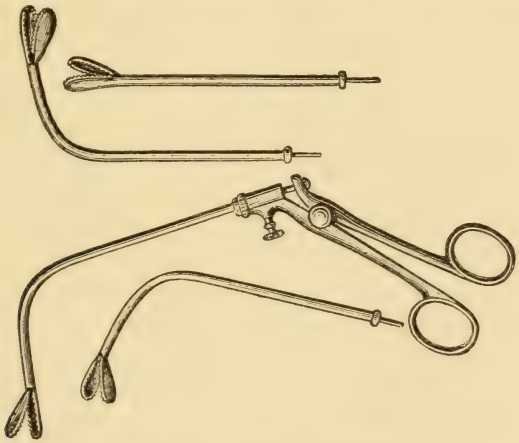

FIG. 104.—Gottstein's Forceps.

as that shown as one of the attachments to the Stoerk instrument, are very similar to those for the use of the snare.

The dislodgement of growths by means of the forcible introduction of a sponge probang into the larynx is one recommended by Voltolini,[1] and is especially suitable for small pedunculated growths attached near the edge of the vocal cords, although ordinarily it would not be resorted to except in those cases in which tolerance of instruments is not easily secured, on the part of the patient. This is practically the method which Green used [2] before the introduction of the laryngoscope.

Destruction of growths in the larynx may be accomplished by either the chemical or potential cautery. Of the chemical agents, notwithstanding the objection of Mackenzie,[3] I much prefer the

[1] Monatschr. für Ohrenheilkunde, 1877, p. 17. [2] Op. cit. [3] Op. cit., p. 82.

use of chromic acid to any other caustic. This may be fused on the end of a properly curved probe, after the manner already described;[1] or, in order to protect the healthy tissues, a hooded porte-caustique may be used. I have frequently resorted to the very simple device of wrapping a large pledget of cotton firmly on the end of the laryngeal probang, and then placing a saturated solution of the chromic acid on that portion of the pledget which will impinge directly on that part of the growth which it is desired to destroy. Nitrate of silver I regard as inefficient as a destructive agent, while the more powerful caustics, such as caustic potash, Vienna paste, and nitric acid, should never be used in the larynx, on account of the difficulty of limiting their action.

The use of the galvano-cautery in the larynx possesses this great advantage: that the electrode can be placed *in situ* before the heat is developed in the platinum tip, and the current opened again before withdrawing the instrument, thus restricting its action entirely to the point which it is desired to cauterize. Hence, in those cases where the milder chemical agent is inefficient, I am disposed to think that we possess no method of destroying laryngeal neoplasms comparable to it. The size and shape of the electrode, of course, should be adapted to the character of the growth with which we have to deal, although in most instances it will be wiser to use the smaller-sized platinum tips, and to nicely adjust the strength of the current to the proper heating power.

Previous to the introduction of local anæsthesia, it was necessary, before removing a growth from the larynx, to subject the patient to a somewhat long course of training, consisting of the daily introduction of probes into the larynx, in order to secure a sufficient amount of tolerance and self-control on the part of the patient to enable him to submit to the operation. This has been rendered practically unnecessary by the discovery of cocaine, in that, by the use of this drug, the mucous membrane of the fauces and larynx can be so far anæsthetized as to admit of considerable manipulation, without exciting reflex contraction. For this purpose, a twenty-per-cent solution should be applied freely to the fauces and the larynx by means of the spray, and the action of the drug tested at the end of from three to four minutes, by passing a pledget of cotton, saturated with the solution, into the laryngeal cavity. As a rule, complete anæsthesia follows the application of a twenty-per-cent solution of cocaine at the end of about five minutes, although the period varies greatly in different individuals; hence, it is well to test the parts repeatedly until complete anæsthesia is found to be established.

[1] Vol. i., p. 145.

When this occurs, it is well to proceed promptly with the operation, in that local anæsthesia is far more ephemeral in the pharynx and larynx than in the nasal cavity, and cannot be depended upon for longer than from eight to ten minutes. It is to be borne in mind that local anæsthesia does not secure amenity from reflex contraction of the faucial muscles; hence, when the membrane is rendered completely insensible, the operation may be hampered by involuntary muscular contractions of the fauces. This can be to a certain extent controlled by having the patient swallow some small pellets of ice during the intervals between the cocaine applications. Local applications of chloral and morphine are probably of little avail.

When the parts are prepared, the patient is directed to protrude the tongue, and hold it firmly between the thumb and forefinger of his right hand, a napkin being interposed; the illuminating rays are then thrown upon the fauces, and the laryngeal mirror introduced, held in the left hand of the operator. The head of the patient should be thrown well back, resting firmly upon a headrest; in this manner, the anterior cervical muscles are fully extended, and the larynx raised to a position which notably facilitates the manipulation.

The first step consists in bringing the neoplasm into view; as soon as this is accomplished, the forceps (being previously warmed) are grasped firmly in the right hand, and the beak of the instrument passed directly into the fauces, until it nearly reaches the pharyngeal wall, after which it is carried down into the larynx. This should be accomplished without impinging in any way upon the walls of the pharynx or larynx. As the beak of the instrument is passed downward, and approaches the growth, it comes into view in the laryngeal mirror, after which its further movements are easily directed by the eye.

The mirror should be held firmly and immovably in the fauces, keeping the neoplasm in view during the whole of the manipulation, the beak of the instrument not being seen ordinarily until it is observed in the laryngeal image approaching the growth.

If the growth is supra-glottic, immediately before the beak of the forceps is turned toward the laryngeal cavity, the patient should be directed to take a full inspiration, and follow this by the utterance of a high-pitched, prolonged "A," thus securing the fullest elevation of the epiglottis, and the widest exposure of the laryngeal cavity, and at the same time to an extent diverting the attention of the patient toward the accomplishment of the above direction in the utterance of the prolonged "A." In some instances, the seizure of the growth may be best accomplished during either

expiration or inspiration, although the phonatory position of the larynx will prove most favorable in the majority of cases.

The principal difficulty in accomplishing this manipulation lies in the fact that even after complete anæsthesia, upon the impact of the instrument, the thyro-epiglottic muscle contracts so firmly as to close the laryngeal vestibule in such a way as to shut off the view; hence, it is of the utmost importance to accomplish the manipulation without touching the laryngeal walls.

The tumor itself is usually not sensitive, and the cords themselves but to a somewhat slight degree. These contractions are usually excited by touching the ary-epiglottic folds or the ventricular bands.

The choice of an instrument in any given case will depend, of course, upon the size, character, and location of the growth. It is to be remembered also that the depth of the larynx varies greatly in different individuals; it is therefore of importance, that the descending portions of the blades should be of such length that the growth can be reached without the shaft of the instrument impinging upon the epiglottis.

It is scarcely necessary to add that the forceps should be introduced, closed and only opened at the moment the growth is to be seized.

I think that a reading of the description of an endo-laryngeal removal of a growth would give the impression that this is a simple and easily accomplished manipulation. This is certainly not true of most cases, in that I know of no operation in the throat which requires greater manipulative skill and dexterity, and such as can only be acquired by long training and practice. Of course one cannot be expected to gain this dexterity by practising on the living subject: a larynx from a cadaver, however, can always be arranged in such a way as to represent the organ *in situ*, and can be practised upon with great advantage by the beginner.

A very small-sized papilloma is probably best removed by the Schroetter tube forceps; for the larger growths, I think most operators will give decided preference to the stout Mackenzie or Fauvel bladed forceps. These large growths are rarely removed at one sitting, but are taken piecemeal at intervals of from three or four days to a week, according to the tolerance of the patient and the traumatism which accompanies the operation.

Fibromas which project prominently into the laryngeal cavity are probably best removed by means of the snare, while those which are deeply imbedded are most easily reached by the cutting forceps or curette. It is probably wiser, in the case of small fibromas, which are deeply imbedded and inaccessible, to let them

alone, in that any attempt at operation is liable to do injury to the parts, while the mere existence of the growth itself involves no special danger to life, and the possibility of restoring the impaired vocal function is exceedingly doubtful.

Cystomas disappear promptly upon evacuation of the sac contents by the use of the concealed or naked knife.

Myxomata, whether sessile or pedunculated, should be seized and torn away by the bladed forceps.

If an angioma is so located as to admit of the use of the wire loop, this should be employed in preference to evulsion by any form of forceps, for, whereas the tumor is soft and easily torn away, there is no little danger of exciting troublesome hemorrhage; thus, in the case reported by Ferreri,[1] after evulsion of a tumor of this character by the forceps, hemorrhage of so severe a nature set in that it became necessary to open the larynx and insert tampons, a preliminary tracheotomy having been done previously. The patient died two days later, of pneumonia. That this danger of hemorrhage is not obviated by the use of the snare is shown by Heinze's case,[2] in which the tumor was extracted by this method, as it was followed by repeated and severe hemorrhages which were only controlled by cauterization. This danger certainly should be kept in view, and it becomes a question whether the growth might not be destroyed by the galvano-cautery with more safety to the patient; or, in case the tumor has attained a large size, probably thyrotomy would be the more judicious procedure, either with or without a preliminary tracheotomy.

Enchondromata of small size may be successfully dealt with by cauterization: the larger growths, however, as a rule, will demand thyrotomy; although in Asch's[3] case, that of a small growth projecting from the thyroid cartilage, as well as in Stoerk's case, in which the tumor sprang from the arytenoid, successful extirpation was accomplished with the forceps. In Porter's[5] case, of an epiglottic enchondroma, the epiglottis was amputated.

After the removal of a laryngeal tumor, a certain amount of after-treatment is generally necessary, both to destroy small fragments that may be left after evulsion or other methods of removal, or to prevent recurrence, this latter having mainly to do with papillomata. This consists in the application of caustics at intervals of a week or longer. For this purpose, probably no agent is more efficient than chromic acid, fused on the end of a delicate probe, after the manner already described.

If more active measures for destruction are indicated, the gal-

[1] Loc. cit. [2] Loc. cit. [3] Loc. cit.
[4] "Klinik der Krankheit. des Kehlkopfes," p. 417. [5] Loc. cit.

vano-cautery may be used. For those growths which cannot be destroyed or extirpated by endo-laryngeal methods, it will become necessary to obtain direct access to the tumor by an external opening into the larynx. The operations which have been done for this purpose are: thyrotomy, subhyoid pharyngotomy, and infra-thyroid laryngotomy. These operations are described in a later chapter. It is impossible to lay down the special indications for the performance of any one of these operations, as in any given case of neoplasm which demands removal, and which cannot be reached through the natural passages, the laryngeal cavity will be opened in such a way as will give the best access to the tumor, and at the same time involve the least danger of permanent impairment of function.

Thyrotomy, of course, gives the widest access to the larynx, and yet it not only involves serious danger of a permanent impairment of the voice, but also a certain amount of danger to the patient, especially where a preliminary tracheotomy has been done. Where feasible, therefore, a subhyoid pharyngotomy or subthyroid laryngotomy would probably be preferred; unfortunately, however, the number of cases in which these latter operations are available is very small. Bruns,[1] in a collation of 38 cases of thyrotomy, in which the subsequent vocal impairment could in no wise be traced to a recurrence of the tumor, found the voice lost in 6 cases, almost completely aphonic in 14, and practically restored in but 18. As regards the comparative success of thyrotomy over endo-laryngeal methods, the same observer[2] reports 39 cases of laryngeal papillomata operated upon by thyrotomy, in 21 of which recurrence took place; while of 90 cases operated upon by the endo-laryngeal method, recurrence took place in but 30. The inference here, as Bruns observes, is somewhat deceptive, in that thyrotomy of course was done in aggravated cases only. In this connection perhaps the somewhat ingenious operation which Rossbach[3] performed in two cases of laryngeal growth should be mentioned. One was a cyst at the anterior angle of the cords, and the other a papilloma on the anterior third, both on the upper surface. His operation consisted in passing a very slender lance-pointed knife directly through the thyroid cartilage at such a point in the median line that it entered the larynx on a level with the upper surface of the cord; then directing the movements of the knife by the laryngeal mirror *in situ*, he severed the attachments of the growths.

Before closing the discussion of benign tumors of the larynx,

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[1] "Die Laryngotomie," 1878. [2] Op. cit., p. 161.
[3] Berliner klin. Woch., 1880, p. 61.

I quote in full certain propositions laid down by Browne [1] as follows:

First. Attempts at removal of growths from within the larynx, are not in themselves so innocuous as is generally believed; but, on the contrary, direct injury to the healthy parts of the larynx, leading to even fatal results, is by no means of infrequent occurrence.

Second. The functional symptoms occasioned by benign growths in the larynx are in a large proportion of cases not sufficiently grave to warrant instrumental interference.

Third. Many of these new formations will disappear, or be reduced, by appropriate local and constitutional medical treatment, especially when of recent occurrence.

Fourth. Recurrence of laryngeal growths after removal *per vias naturales* is much more frequent than is generally supposed.

Fifth. While primary malignant or cancerous growths are of rare occurrence within the larynx, benign growths occasionally assume a malignant and even cancerous character, by the irritation produced by attempts at removal.

Sixth. The instruments most generally now in use are far more dangerous than those formerly employed.

Seventh. The cardinal law that an extra-laryngeal method ought never to be adopted unless there be danger to life from suffocation or dysphagia should be applied with equal force to intra-laryngeal operations, and it is a subject worthy of consideration whether in many cases tracheotomy alone might not be more frequently performed, first with a view of placing the patient in safety when dangerous symptoms are present, second in order that the larynx may have complete functional rest, and third as a preliminary to further treatment, radical or palliative.

These statements seem somewhat radical, and, while they cannot be fully indorsed, yet, coming as they do from so accomplished a writer and authority, they are not only worthy of consideration, but carry so much of suggestion that I simply quote them somewhat fully without further comment.

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[1] "The Throat and Nose and their Diseases," 3d ed., London, 1890, p. 453.

CHAPTER XLV.

SARCOMA OF THE LARYNX.

It is only within comparatively recent times that any close distinction has been drawn between the two forms of malignant disease in the larynx, sarcoma and carcinoma. This we can easily understand when we consider the fact that the clinical history and prognosis is much the same in both forms of disease. Of late years, however, the line of distinction is clearly drawn between the two, as the result mainly of a more exact histological study. This is still further accentuated by the fact, so clearly established by Butlin, that generalization is the rule in carcinoma and the exception in sarcoma.

Sarcoma is to be regarded as of exceedingly rare occurrence in the larynx. Of Fauvel's 300 cases of laryngeal neoplasm, 7 are reported as sarcomatous growths; Von Ziemssen,[1] up to the date of the publication of the Cyclopædia, found only about a dozen cases recorded in literature; Mackenzie[2] records having seen but 5 cases; while the admirable studies of Butlin[3] were based on the investigation of but 23 cases collated from literature.

The frequency of a laryngeal invasion, as compared with that of other regions of the body, is clearly indicated by the report of Gürlt,[4] who made an analysis of all the cases of sarcoma which had been recorded in the "Allgemeines Krankenhaus," and the "Rudolph Stiftung" at Vienna. He found 848 cases of the disease. Of these, 194 involved either the upper or lower maxilla, 150 the female mammary gland, 60 the lower extremity, 45 the testicle, 26 the neck and the submaxillary region, 15 the nose and nasal cavities, 2 the naso-pharynx, 33 the parotid gland, 3 the tonsils, 10 the pharynx, and the larynx in but one instance. In the same institutions, there had been recorded 9,554 cases of carcinoma, 62 of which invaded the larynx. This probably is a fair indication of the comparative frequency of the two forms of malignant disease in all regions of

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[1] "Cyclop. of the Practice of Medicine" Amer. ed., New York, 1876, vol. vii., p. 900.

[2] "Diseases of the Throat and Nose," Amer. ed., Phila., 1880, vol. i., p. 344.

[3] "Malignant Disease of the Larynx," London, 1883.

[4] Arch. für klin. Chir., 1880, vol. xxv., p. 436.

the body, being in the proportion of nearly 12 to 1; while the exceeding great rarity of a sarcomatous invasion of the larynx is indicated by the fact that it stands in the proportion of 1 to 62 of carcinoma.

ETIOLOGY.—I find recorded in medical literature 48 cases of sarcoma of the larynx. Of these, however, one of the cases reported by Mackenzie[1] should be excluded, it having been subsequently reported upon as papillomatous. The case reported by Ruppaner,[2] which Mackenzie[3] includes among sarcomas, is also excluded, it having been of a carcinomatous nature.

In addition to these, a single case has come under my own observation:

A male, aged 60, presented on August 29th, 1887, with a history of laryngeal symptoms dating back for two years, which for three weeks had given rise to moderate dyspnœa. This was found to be due to a grumous-looking mass in the larynx, evidently malignant in character. It sprang from the right side, although the cervical glands were not enlarged. Tracheotomy, becoming necessary, was performed on September 27th, and on October 11th thyrotomy was done, and a growth the size of a large chestnut found, which proved to be an alveolar sarcoma. It had infiltrated the thyroid and cricoid cartilages to such an extent that complete right resection of the larynx was performed. The operation was successful, and every vestige of the growth was extirpated. The patient succumbed to pneumonia in the following April.

Our conclusions are therefore based on an analysis of 47 cases. Of these, 34 occurred in males, and but 13 in females. As regards age, 1 occurred in the second decade of life or between ten and twenty, 4 in the third, 7 in the fourth, 9 in the fifth, 11 in the sixth, 6 in the seventh, and 2 in the eighth; the youngest of these cases being a female aged nineteen, observed by Caselli[4] and the oldest those of Lange[5] and Elsberg,[6] each being 74.

In none of the cases does heredity seem to have played an active part in the causation of the disease. In many instances the development of the growth seems to have been preceded by local inflammatory troubles, and yet to attribute any causative action to a simple catarrhal laryngitis would be purely speculative. As a rule, the affection develops without any apparent cause and in patients enjoying good health. Foulis'[7] case seems to have developed from a simple papilloma of the larynx.

PATHOLOGY.—The histological character of the growth differs in no essential degree from sarcomas found in other portions of the

[1] Trans. of the Path. Soc. London, vol. xxi., p. 51.
[2] New York Med. Jour., March, 1870, p. 345. [3] Op. cit., vol. i., p. 345.
[4] Bolletino delle Scienze med. di Bologna, 1880, vol. v.
[5] Archives of Laryng., vol. i., p. 36.
[6] New York Med. Record, vol. xxi., p. 80.
[7] The Lancet, London, October 13th, 1877, and March 29th, 1879.

body. Of the cases reported, 3 were alveolar in character, 5 round-celled, 6 spindle-celled, 2 mixed-celled, 2 lympho-sarcoma, 4 are reported as papillary sarcomas, while there were 1 each of fibro-sarcoma, adeno-sarcoma, and fibro-myxo-sarcoma.

In 16 cases the disease originated in the vocal cords, being about equally frequent on both sides, while in 4 instances both sides were invaded. The growth sprang from the left ventricular band in 5 instances, and from the right in 4. In 2 instances the right ventricle was primarily invaded, while in 5 the disease originated in the epiglottis. In one case, reported by John Mackenzie,[1] the growth sprang from the right pyriform sinus. In 2 cases the origin of the growth was subglottic, my own and one reported by Balassa.[2]

In most instances the growth seems to confine itself to the laryngeal cavity, and, where an extension occurs, the tendency is downward. Thus, in Schnitzler's[3] and Hahn's[4] cases the trachea was involved subsequently, while in Macleod's[5] case, as well as in one of Browne's,[6] the disease started in the tonsil and pharynx. In a single instance, that reported by Fauvel,[7] the disease seems to have started in the commissure, although this region was not infrequently invaded subsequently. Caselli's case is unique in the fact that it invaded the larynx, pharynx, soft palate, and base of the tongue. As a rule, however, the disease is not only unilateral in this region, but tends to remain so. Instances in which the opposite side of the larynx was invaded by extension are reported by Robinson,[8] Navratil,[9] Rauchfuss,[10] and Fauvel.[11] In another case by the same observer,[12] and also in one of Fournier's,[13] the disease seems to have developed simultaneously in both sides of the larynx.

SYMPTOMATOLOGY.—The symptoms to which growths of this character give rise present no peculiarities. They are dependent practically on the size and location of the tumor, and have to do mainly with impairment of function. The earliest symptom is impairment of voice, giving rise to either hoarseness or complete aphonia, while, as the air spaces are encroached upon, interference with respiration sets in.

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[1] New York Med. Record, vol. xxvii., p. 583.
[2] Wien. med. Woch., 1868, No. 92. [3] Wien. klin. Woch., 1889, p. 467.
[4] Volkmann's "Sammlung klin. Vorträge" (Chirurgie), No. 82, p. 16.
[5] The Lancet, London, 1884, vol. i., p. 750.
[6] "The Throat and Nose and their Diseases," 3d ed., London, 1890, p. 481.
[7] "Traité Pratique des Mal. du Larynx," p. 498.
[8] Amer. Jour. of Med. Sciences, 1875, n. s., vol. lxix., p. 394.
[9] Berl. klin. Woch., 1868, p. 501.
[10] St. Petersburg. med. Zeit., 1862, vol. vi., p. 44. [11] Op. cit., p. 332.
[12] Op. cit., p. 571. [13] Gaz. des Hôpit., 1875, p. 531.

There is generally more or less secretion from the surface of the growth, hence cough is usually present; this is rarely a persistent or distressing symptom, except where the tumor extends below the glottis. If the growth extends upward, and involves the epiglottis or the parts above, dysphagia is liable to occur.

Pain is rarely present. Owing to the attrition to which the growth is subjected, erosion or ulceration is liable to occur quite early in its history, in which case the sputa may be tinged with blood, though I know of no instance in which grave hemorrhage has occurred.

The rapidity of growth seems to vary notably in different cases; thus, in the instance observed by Laroyenne,[1] the tumor completely filled the larynx at the end of two months; while in Schech's case [2] the same occurred in the fourth month.

It is a notable fact, in connection with sarcoma of the larynx, that a tendency to generalization is exceedingly feeble, as shown by the fact that the cervical glands are very rarely the seat of secondary infiltration. Of all the cases reported, this feature was observed in but six instances, viz.: Gerster's,[3] Macleod's,[4] two of Browne's,[5] and two of Fauvel's.[6] The variety of sarcoma in these cases was, respectively, alveolar, spindle-celled, and mixed-celled. This peculiarity of sarcoma is very ingeniously explained by Butlin,[7] who states that "the sarcomas of these parts arise by the proliferation of the cellular elements of the solid structures of the connective tissues. As the cells proliferate, the solid structures gradually swell, and the lymphatic vessels suffer a diminution of their calibre, which proceeds to their complete obliteration, and renders them incapable of transmitting the infecting material of the tumor." This observation of Butlin's is still further accentuated by the fact that in but a single instance reported has this tendency to generalization extended farther than the cervical glands, viz., in a case observed by Rollier,[8] in which there was metastatic involvement of the lungs, liver, and brain, death occurring from these complications three months after the primary invasion of the larynx.

After the disease has persisted for a considerable period, in many instances a form of cancerous cachexia seems to set in; yet this rarely presents the prominent features of the carcinomatous cachexia.

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[1] Gaz. Hebdomadaire, 1873, p. 780.
[2] Arch. für klin. Med., vol. xvi., p. 236.
[3] Annals of Surgery, 1886, vol. iii., p. 20.
[4] Loc. cit. [5] Loc. cit. [6] Op. cit.
[7] "Malignant Diseases of the Larynx," London, 1883, p. 14.
[8] Internat. Centralblatt für Laryngol., Rhinol., etc., vol. ii., p. 320.

DIAGNOSIS.—These growths present an irregularly rounded outline, sometimes of a pinkish, but generally of a grayish, semi-opaque color. They are soft in consistency, and their general aspect is perhaps best described by the term "grumous."

We have no definite means of distinguishing by gross inspection between a sarcoma and a carcinoma. There is always something in the aspect of a malignant growth in the larynx which, while difficult to describe, presents an appearance of malignancy, which to the practiced eye is not easily mistaken. Its prominent features consist in irregularity of outline, the notable distortion of the parts which results from its development, its peculiarly unhealthy aspect, together with the thick, ropy muco-pus which generally adheres to its surface.

Ulceration is the rule in the later stages of carcinoma, but rarely occurs in sarcoma, although the surface of the latter form of growth usually shows points of erosion, as the result of which the secretion is apt to take on a more purulent character.

The absence of enlargement of the cervical glands is always a diagnostic point in favor of sarcoma; and yet it must be remembered that this complication of carcinoma only occurs late in its history. The differential diagnosis between the two forms of malignant disease, at best, is not often established until a portion of the growth has been removed and submitted to a microscopic examination.

PROGNOSIS.—The disease is an exceedingly fatal one, and only less so than carcinoma of the larynx. Of the 47 cases which I have collected, the histories are incomplete in most instances. In 18 death is recorded, and in 13 the report is complete, from which it is shown that the average duration of life from the onset of the symptoms was nineteen and one-quarter months. The cause of death was from recurrence in 6, from suffocation in 4, from pneumonia after extirpation in 2, from hemorrhage after extirpation in 1, from generalization in 1, from congestion of the lungs and nephritis in 1, and from asthenia in 3.

TREATMENT.—In 5 of the cases collated, no operation was done, and death ensued in each instance, the average duration of life being seventeen months. In 11 cases, complete extirpation of the larynx was performed: of these, 8 died, the average duration of life after the onset of the symptoms being twenty-one and two-thirds months. In 3 cases of extirpation, viz., those of Bottini,[1] Foulis,[2] and Caselli,[3] the operation was entirely successful. In two

[1] Giornal della R. Acad. de Med. di Torino, May 20th, 1875, No. 14.
[2] Loc. cit. [3] Loc. cit.

cases, viz., those of Gerster[1] and Küster,[2] one-half of the larynx was resected, with complete success. In the former case, a male, aged fifty-seven, the disease was of only five months' duration; while in the latter, a male, aged fifty, the patient had been subjected to a number of endo-laryngeal operations previous to the more radical procedure. In the cases observed by Laroyenne,[3] Balassa,[4] Hjorth,[5] and Rauchfuss,[6] access to the growth was obtained by thyrotomy, after which evulsion and cauterization were resorted to. In Schnitzler's case,[7] the tumor extending below the glottis, the trachea was opened, and a similar method pursued, the laryngeal portion of the growth being extirpated through the natural passages.

These cases were all cured, with the exception of that of Rauchfuss, which is simply reported as having been improved. In a case observed by Burow,[8] a male, aged thirty, in which the tumor involved the epiglottis, recurrence taking place four months after removal by the snare, subhyoid pharyngotomy was done, the tumor being removed by the curette, and its base cauterized. There was no recurrence.

In 21 cases, the measures of relief were confined entirely to the use of the forceps, snare, and knife, manipulated through the natural passages. Of these, 6 were cured, 8 improved, in 2 there was recurrence, while 4 died. In 1 case the result is not given.

The above analysis of cases shows sufficiently clearly what the indications are for the treatment of these cases, and also the promise of success.

No suggestions can be made as to the selection of an operation in any given case, as in each instance this decision must be based entirely on the duration of the disease and the size and location of the growth. In the early stages of the affection, and before the tumor has attained large size, I think no one need hesitate to remove it through the natural passages, since the recorded cases show very clearly that, even where this method fails, there is no risk incurred of stimulating the tumor to any dangerous activity of development. In case the growth is not successfully extirpated by the endo-laryngeal method, there can be no question of the wisdom of proceeding promptly to the performance of thyrotomy, in view of the good results which have attended those operations in the analysis of cases given above.

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[1] Loc. cit. [2] Beilage zum Cent. für Chir., 1884, No. 23, p. 57.
[3] Loc. cit. [4] Loc. cit.
[5] Norsk Magazin for Laegevidenskaben, Dec., 1888, No. 12.
[6] Loc. cit. [7] Loc. cit.
[8] Arch. für klin. Chir., vol. xviii., p. 249. Berl. klin. Woch., 1877, p. 101.

The further indications for the performance of resection or, in aggravated cases, of complete extirpation of the larynx, need not be dwelt upon in further detail, since, in case of failure to extirpate the disease by the simpler operations, it seems to me the more radical measure becomes imperative, unless specially contra-indicated by the general condition of the patient.

CHAPTER XLVI.

CARCINOMA OF THE LARYNX.

THE rarity of carcinomatous invasion of the larynx is indicated by the fact that Gürlt,[1] in a report of 11,131 cases of carcinoma, which had been recorded in three of the large hospitals of Vienna, found the larynx invaded in but 63; while Lébert,[2] in a collation of 9,118 cases of cancer, found this organ affected in but 3 cases; Winniwarter,[3] out of 548 cases, found one case of laryngeal cancer, and Baker[4] finds the larynx affected three times in 500 cases.

As showing the frequency of laryngeal cancer as compared with this affection in other portions of the air tract, Gürlt,[5] in his 11,131 cases, found 4 in the nasal cavity, none in the naso-pharynx, 22 in the pharynx, 6 in the tonsil, and 15 in the soft palate. There were thus 63 cases in the larynx, as compared with 47 in the air tract above.

ETIOLOGY.—Heredity exercises the same important influence in laryngeal cancer as in other regions of the body. This is traceable in from twenty to twenty-five per cent of the cases reported.

It is much more frequent in the male than female. Thus, of 50 cases collated by Butlin,[6] 40 were males and but 10 females; while in Gürlt's cases 51 were males and 12 females.

The disease belongs essentially to the late years of life. Thus, in a compilation made by Mackenzie,[7] 6 occurred in the third decade of life, 16 in the fourth, 45 in the fifth, 58 in the sixth, 34 in the seventh, and 10 in the eighth. The earliest case reported is one by Rehne,[8] that of a child dying of suffocation from a laryngeal tumor which had existed for two years. The neoplasm was found to be an epithelioma.

Occasionally a patient traces the origin of the disease to some over-use or strain of the voice, or perhaps to an attack of laryngeal

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[1] Arch. für klin. Chir., 1880, vol. xxv., p. 426.
[2] "Traité des Mal. cancér.," Paris, 1851, p. 93.
[3] "Beiträge zur Statistik der Carcinome," Stuttgart, 1878.
[4] Med.-Chir. Trans., vol. xlv., p. 390. [5] Loc. cit.
[6] "Malignant Diseases of the Larynx," London, 1883, p. 31.
[7] "The Case of Emperor Frederick III.," New York, 1888, p. 270 *et seq.*
[8] Virchow's Archiv, 1868, vol. xliii., p. 129.

catarrh. It would seem probable, however, in these cases, that the symptoms are really due to the onset of the malignant affection.

PATHOLOGY.—The histological characters of laryngeal cancer differ in no essential degree from those found in other portions of the body. By far the most frequent variety found in this region is epithelioma. Thus, in those of Gürlt's cases which were reported upon, 24 were epithelioma and 1 medullary cancer. In most of the published statistics, the terms "carcinoma" and "epithelioma" are used without much apparent discrimination, and hence little information on the subject is afforded.

Cancerous growths may spring from any portion of the larynx, though in the largest number of instances, apparently, they have their origin in the ventricular bands. Thus, in 53 cases seen by Mackenzie[1] the origin was from the ventricular bands in 28, the vocal cords in 7, the anterior commissure of the cords in 2, the epiglottis in 6, the cricoid cartilage in 1, and the whole of the larynx in 9; while of 37 cases observed by Fauvel[2] the disease originated in the ventricular bands in 21 cases, the true cord in 1 case, the inter-arytenoid commissure in 1 case, the epiglottis in 1 case, the whole of the left side of the larynx in 10 cases, and in 3 cases the entire larynx was so much involved that the exact site of origin could not be made out. In Butlin's[3] 50 cases, on the other hand, the growth sprang from the epiglottis in 6, the ary-epiglottic folds in 3, the arytenoid in 2, the pyriform sinus in 1, the true cord in 8, the thyroid angle in 3, the false cord in 1, the ventricle in 2, below the glottis in 5 cases, the whole of the larynx in 10, and half the larynx in 9.

It is a well-recognized clinical fact that primary cancer of the larynx, as long as it confines itself within the cavity, shows but a limited tendency to involvement of the lymphatic glands of the neck. This law applies, practically, only to intrinsic growths, namely, those which involve the cavity of the larynx proper, in contradistinction to extrinsic growths, or those which involve the epiglottis, the ary-epiglottic folds, or the arytenoids. Krishaber makes the absolute statement that an intrinsic cancer, so long as it confines itself to the laryngeal cavity, does not affect the lymphatic glands of the neck, although an extrinsic cancer may affect the glands at a comparatively early period. Butlin,[5] in a careful analysis of his cases, with reference to this point, found that of 12 cases of extrinsic cancer, the glands were affected in 8, not affected in 2, and in 2 this symptom was not reported on; while of 14 in-

[1] "Diseases of the Throat and Nose," Amer. ed., Phila., 1880, vol. i., p. 335.
[2] "Traité pratique des Maladies du Larynx," Paris, 1876, p. 693.
[3] Op. cit., p. 35. [4] Gaz. Hebdom., 1879, p. 540. [5] Op. cit., p. 45.

trinsic tumors the glands were affected in 2 cases, unaffected in 6 cases, and not stated in 6; in 5 cases of subglottic cancer, the glands were affected in one instance, and unaffected in 4. While, therefore, Krishaber's law applies in probably the large majority of cases, it cannot be accepted as absolute.

It would seem by no means an easy matter to harmonize this clinical observation with the teachings of anatomists, who have shown us that the capillary network of lymphatics which courses through the submucous tissues is equally rich in both the intrinsic and extrinsic portions of the larynx, and that an abundant connection is established between both these regions and the lymphatic glands of the neck. The later investigations, however, of Sappey[1] have shown that, whereas the lymphatics of the air passages are more developed in the human species than in any other of the mammalia (and this is especially true of the laryngeal supply), in the superior portion of the larynx the vessels are multiplied to infinity, forming a close network covering the epiglottis and stretching toward the ary-epiglottic folds. As it reaches the ventricular bands and lower portions of the larynx, it becomes more and more attenuated, until, in passing from the superior half of the lining membrane of the larynx, the lymphatic system seems to become abruptly impoverished. This attenuation, moreover, is more evident with advanced age. Herein, I think, lies a very simple and clear explanation of the fact that malignant disease in the intrinsic or lower portion of the larynx fails in so many cases to result in involvement of the cervical lymphatics. Regarding this lymphatic involvement as the first stage of generalization of cancer, the same explanation can be given of the fact that dissemination is a comparatively infrequent complication of the disease. That it may occur, however, is shown by the instances of this reported by Sands,[2] Desnos,[3] and Schiffers.[4]

SYMPTOMATOLOGY.—There is nothing in the development of a laryngeal cancer which gives rise to symptoms differing in any notable way from those which characterize the onset of a benign growth. Vocal impairment is the first symptom which manifests itself, and even this may be absent for a considerable period, especially in those cases which commence in the ventricular bands. As the tumor increases in size, the voice becomes weaker, and finally almost completely lost. The next symptom to develop is dyspnœa, according as the growth encroaches upon the breathing space:

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[1] "Vaisseaux lymphatiques chez l'Homme," Paris, 1874 to 1885.

[2] New York Med. Jour., 1865, p. 110.

[3] Bull. de la Soc. anat., 1878, 4th series, vol. iii., p. 398.

[4] Revue mens. de Laryngol., 1883, p. 1.

while, in the case of an extrinsic cancer, dysphagia may develop, owing, in the early stages, to the mechanical obstruction which is set up by the encroachment of the growth upon the food tract. As the direct result probably of this latter symptom, salivation becomes a prominent symptom in a large proportion of cases. According to Fauvel,[1] this occurs in every case.

Glandular enlargement if present occurs somewhat early in the history of the case. In the course of from three to six months, the growth usually attains such size as to not only render the subjective symptoms above spoken of quite prominent, but to lead to the development of certain new symptoms, the most important of which are ulceration and hemorrhage. Ulceration is due, in part, perhaps, to the attrition to which the growth is subjected in the functional movements of the parts, but more, undoubtedly, to the increased rapidity of cell proliferation, which occurs with its increased size. After the ulceration sets in, it not only involves the superficial parts of the tumor, but shows a tendency to form fissured or crater-like excavations, the result of interstitial necrosis. This is especially characteristic of encephaloid cancer. In epithelioma, on the other hand, the ulceration is more superficial in character.

Before ulceration occurs, the secretion from the part consists merely of a slight excess of healthy mucus, the accumulation of which in the larynx may give rise to slight irritation, and perhaps cough. After ulceration sets in, the secretion becomes somewhat excessive, and consists of a thin sero-mucus, more or less freely surcharged with pus cells and necrotic tissue. It is of a grayish-yellow color and somewhat unhealthy aspect. At the same time, the characteristic odor of cancerous ulceration becomes plainly noticeable in the patient's breath. This is apt to be exceedingly offensive, and is decidedly fetid in character; and yet the fetor has a peculiar musty smell, which, while difficult to describe, when once experienced is always associated with malignant disease.

Hemorrhage occurs in consequence of the ulceration, and may be very slight, simply tinging the sputa; or, as the result of an erosion of one of the arterial twigs, which are distributed in the larynx, repeated bleedings may occur. But one case of fatal hemorrhage from a laryngeal cancer, however, as far as I know, has been reported, viz., that of Dreyfuss.[2]

Pain is a somewhat constant symptom, although in rare in-

[1] Op. cit., p. 707.

[2] Cited by Gottstein: "Die Krankheiten des Kehlkopfes," Leipzig und Wien, 1888, p. 164.

stances entirely absent. It is more characteristic and more prominent in extrinsic cancer than in intrinsic. It may occur merely during the act of deglutition, or it may be constant. It is of a sharp, lancinating character, and usually radiates toward the ear, although it may extend over the whole side of the neck.

The cancerous cachexia, while always a late manifestation in carcinoma, is more delayed in the laryngeal form of the disease than in most others, and in many instances entirely absent. This fact is explained by the lymphatic isolation of the larynx, already described. The grayish-yellow discoloration of the skin, the shrunken features, and premature appearance of age, which evidence this cachexia, need no especial description.

DIAGNOSIS.—There is nothing in the gross appearances of carcinoma in its earlier stages which renders it possible to make an absolutely definite diagnosis. While, however, it presents as a somewhat clearly defined tumefaction, it is to be borne in mind that the disease consists essentially in a cell infiltration, which burrows, somewhat broadly and deeply, into surrounding parts. Hence, the defined tumefaction recognized on laryngoscopic examination by no means shows the whole extent of the diseased action. As the result of the deeper infiltration, extending to the muscles and perhaps articulations, the normal motility of the parts is liable to be seriously impaired, even at a comparatively early stage of the disease. This condition is one easily made evident by careful inspection of the cavity, and when recognized in connection with a tumefaction in the larynx should lead to a serious suspicion of malignant invasion. In the later stages of the disease, the diagnosis is comparatively easy: there is something in the whole appearance of the larynx which clearly indicates malignant action; the prominent features are the broadly infiltrating, irregular mass which fills the laryngeal cavity, the complete distortion of the parts, the extensive ulceration, the peculiar character of the secretion, and the fetid odor. These, taken in connection with the age of the patient, the enlargement of the cervical glands (if such be present), the progressive development of symptoms, together with the lancinating pains radiating toward the ear, and the cachexia in the very late stage, enable one to recognize the true character of the disease beyond much question of doubt.

PROGNOSIS.—Cancer in any region of the body is not only one of the most fatal, but one of the most distressing of diseases. Its development in the larynx would seem to add an additional element of suffering and fatality, in that it thus interferes with one of the most vital functions, viz., respiration. According to Baker,[1] the

[1] Med.-Chir. Trans., vol. xlv., p. 404.

average duration of life, without operation, in cancer of the breast is 43 months, in cancer of the bones $23\frac{6}{10}$ months, of the tongue $22\frac{5}{10}$ months, of the muscular and other connective tissue $14\frac{6}{10}$ months, of the lymphatic glands $13\frac{6}{10}$ months, of the gums, palate, and tonsil $12\frac{4}{10}$ months, and of the rectum $29\frac{2}{10}$ months; and yet Fauvel[1] reports that in seven cases of encephaloid cancer of the larynx, not operated upon, the average duration of life was three years; and in six cases of epithelioma, not operated upon, the average duration of life was one year and eleven months. While, therefore, cancer of the larynx is surely a fatal disease, we learn from the above statistics that it is not more rapidly fatal than cancer in the other portions of the body, with the exception of those involving the muscular, connective tissue and lymphatic tissues. It would seem to be a fair inference that a cancer of the larynx, developing as rapidly as the same disease in other portions of the body, would result in death from suffocation in a comparatively short period. We reach the conclusion, therefore, that for some reason the growth develops more slowly in this region, or else that the early ulceration results in such a loss of tissue that a sufficient patency of the air passages is maintained to admit of respiration for a longer period.

TREATMENT.—There are certain general and local measures, to be resorted to in the treatment of cancer of the larynx, which mitigate in a marked way the suffering which this disease entails. That they prolong life in any way cannot be claimed. These measures, in brief, consist in the local application, by means of sprays or in the form of powders, of anodynes and disinfectants.

For the latter purpose, we may use a twenty-per-cent solution of peroxide of hydrogen, a one-half-per-cent solution of pyoktannin, a two-per-cent solution of permanganate of potash, or one of the carbolized alkaline solutions, the formulæ of which have already been given,[2] although, for the correction of the fetor which attends cancerous ulceration, no remedy probably is better than iodoform or iodol, preferably the former.

For the local anodyne effect, we may use morphine, either in powder or solution, bearing in mind always that the whole amount applied at one sitting should not exceed the physiological dose. The action of morphine, while more permanent, is by no means as efficient as cocaine, and in most instances our main reliance will consist in the application of a five to ten per cent solution of this latter drug, which may safely be intrusted to the hands of the patient for use by means of a suitable atomizer, as often as may be necessary.

[1] Op. cit., p. 717.

[2] See vol. i., p. 140.

While topical applications undoubtedly add to the comfort of the patient, it is scarcely to be anticipated that any direct effect on the local morbid process will result from this method of treatment, and yet Liegeois[1] reports a case in which a carcinoma of the larynx was apparently rendered stationary for twenty-six months by the daily internal administration of fifteen drops of tincture of Thuja Occidentalis, together with local applications of the same drug.

A prominent indication consists in operative interference. Tracheotomy, of course, is merely a palliative resort, and should be performed promptly upon the supervention of dyspnœic symptoms. Fauvel[2] found that in 8 cases of encephaloid cancer in which tracheotomy was done the average duration of life was three years and nine months, while in 7 cases of the same disease in which tracheotomy was not done the average duration of life was but three years, thus indicating that this operation prolonged life nine months in encephaloid disease. In 7 cases of epithelioma in which tracheotomy was done the average duration of life was four years, and in 6 cases in which the operation was not done the average duration of life was one year and eleven months. In this form of cancer, therefore, this measure apparently serves to prolong life over two years.

The radical measures of treatment embrace the use of caustics, endo-laryngeal operations, thyrotomy, resection and extirpation of the larynx.

The use of either the chemical or potential cautery for the destruction of a laryngeal cancer not only fails to arrest its progress, but almost invariably serves either to stimulate its development or to aggravate all the local symptoms. Its use is therefore to be condemned on every ground.

The removal of a malignant growth by the endo-laryngeal method would commend itself by its simplicity, and yet there is but a single case on record in which this method has been successful. This was in the case of a man aged seventy-five, operated on by Fraenkel,[3] in which the growth, springing from the right vocal cord, attained the size of a pea. It was removed by the galvano-cautery loop. There were five recurrences at intervals of from four to twelve months, after each of which the same operation was repeated, with the result of finally arresting the disease. At one period a large mass appeared in the neck, which was excised.

In a compilation of 22 cases of thyrotomy, made by Mackenzie,[4]

[1] Bull. méd. des Vosges, Jan., 1887. [2] Op. cit., p. 717.

[3] Arch. für klin. Chir., vol. xxxiv., p. 281.

[4] "The Case of Frederick III.," Amer. ed., New York, 1888, p. 266.

death resulted from the operation in periods varying from one to thirteen days in 6 cases, in 5 death occurred within a year, and in 3 death occurred in the second year after the operation. Recurrence took place in 12 cases. The final result in the remaining cases was not reported. In but two instances was the operation successful, both being operated on by Billroth, one of carcinoma in a man aged forty-five, who was well three years later, while the other was an epithelioma in a man aged forty-one, who was reported well two years and nine months after the operation. To these should be added, perhaps, two cases operated upon by Butlin,[1] in which, endo-laryngeal methods failing, thyrotomy was done. The cases are reported as having been cured.

As regards resection or partial extirpation of the larynx, Mackenzie[2] has collated 35 cases in which this operation was done. Of these, 9 succumbed within six weeks after the operation, while 8 died in from two to sixteen months later. In 6 cases, recurrence was reported in periods varying from two to sixteen months, although the final result is not given. Of the remaining cases, in 5 the reports are unsatisfactory; in 6, namely, those reported by Reyher,[3] Schede,[4] Stoerk, Bergmann,[6] Mickulicz,[7] and Simanowski,[8] the patients were well at the end of from twelve to eighteen months, while in a single instance, namely, one of Hahn's,[9] the patient was well nearly three years after the operation. This latter case, alone, Mackenzie accepts as a cure, or 1 in 35, although it seems to me a just inference that the percentage is larger, and that certainly a majority of the cases which survived twelve months possessed a fair promise of ultimate cure.

Coming now to the most radical and seemingly daring operation which has as yet been resorted to in this most fatal of diseases, viz., the total extirpation of the larynx, we find, according to Mackenzie,[10] that practically the whole of the larynx has been removed in 138 cases: 50 of these died as the immediate result of the operation, viz., within six weeks; 23 died within six months; 12 within one year; 6 within two years; while in 3 death is reported, the date not being given. In 6 recurrence took place, in periods varying from three months to two and a half years.

We thus have 100 of the cases in which a fatal issue is re-

[1] Trans. of the Clinical Soc. of London, 1889, vol. xxii., p. 94.

[2] Op. cit., p. 268.

[3] Cited by Foulis: Trans. of the Seventh Internat. Med. Congress, London, 1881, vol. iii., p. 258.

[4] Verhandlung des xiii. Chir. Congresses, p. 90.

[5] Cited by Baratoux: Le Progrès méd., 2d series, vol. iii., p. 265.

[6] Pratique méd., November 22d, 1887. [7] Ibid. [8] Ibid.

[9] Volkmann's "Sammlung klin. Vorträge" (Chirurgie), No. 82. [10] Op. cit.

corded or inferred. Of the remaining 38, 8 are reported as cured, in 5 the histories are imperfect, while 25 are recorded simply as showing no recurrence at periods varying from a few days to eighteen months, viz., in 14 cases there was no recurrence in periods varying from one to six months; in 6 there was no recurrence in periods varying from six to twelve months; while in 5, the report was made up to periods varying from twelve to eighteen months.

The successful cases are those reported by: Thiersch,[1] well at the end of three and a half years; Hahn,[2] well eight years later; Winniwarter,[3] well three and a half years later; two by Gussenbauer,[4] both living five years later; Novaro,[5] living two and a quarter years later; Pretorius,[6] living two and a third years later; and Gottstein,[7] well three and a half years later.

The above are the only cases which Mackenzie concedes to be successful. To this list should be added a third case by Gussenbauer,[8] living three years later; while in Landerer's case[9] there was no recurrence at the end of eighteen months, and in cases operated upon by Maydl[10] and Kocher[11] there was no recurrence at the end of sixteen months.

Offsetting the possibilities of recurrence and death in these latter cases, by the probabilities of success in the 22 other cases in which at the time of report there was no recurrence, I think we may draw the conclusion that of the 138 cases of extirpation 13 have been successful, or a trifle less than ten per cent.

Any attempt to establish clinical indications from a comparison of the results obtained from thyrotomy, partial extirpation and total extirpation of the larynx would necessarily be deluding when we remember that a thyrotomy could only be performed with any hope of success at an early period of the disease, and before the deep tissues and cartilages had been infiltrated. Again, resection, of course, is only indicated in those cases in which the disease still confines itself to one side of the larynx, while total extirpation only becomes necessary when the whole cavity is invaded. The fact that the best results are obtained by resection is therefore in no small part explainable, on the ground that the operation has been done somewhat early in the history of the disease.

When we consider the exceeding fatality of the affection, and

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[1] Deut. Zeit. für Chir., vol. xvi., p. 149.
[2] Arch. of Laryngol., 1883.
[3] Cent. für Chir., 1882, No. 37.
[4] Cent. für Chir., 1883, No. 45.
[5] Cited by Schwartz: "Les Tumeurs du Larynx," Paris, 1886.
[6] Deut. Zeit. für Chir., vol. xix., p. 621.
[7] "Die Krank. des Kehlkopfes," Leipsic and Vienna, 1888, p. 169.
[8] Prag. med. Woch., 1883, No. 34. Schwartz, op. cit.
[9] Mackenzie's cases, No. 82.
[10] Cent. für Chir., 1883, p. 141.
[11] Mackenzie's cases, No. 74.

the feebleness and uncertainty of our remedial measures, we must acknowledge that there are few questions presented to the surgeon which are more difficult of decision than those with which he is confronted in a case of laryngeal cancer. In a large proportion of cases certainly, when an opening into the larynx has been determined upon, the further decision, as to whether the operation shall be a simple thyrotomy, a resection, or a complete extirpation, will depend, in no small degree, upon the knowledge gained, of the extent of the disease, by laryngo-fissure. If there is any teaching derived from a study of the various operations already analyzed, it is the importance of early interference in cases of laryngeal neoplasm which present any suspicious signs.

In any case of neoplasm, in a patient past middle life, which shows any marked disposition to recurrence, and especially if the microscope reveals any tendency to epithelial formation, there can be no question of the wisdom of performing thyrotomy, and thoroughly extirpating every portion of the tumor. If upon this, recurrence takes place, a resection of the larynx should be promptly made. In other words, our measures should be so promptly instituted that the patient should be afforded the hope of relief which resection promises, while the disease is still confined to one side of the larynx; for I think no question should be entertained, in regard to the advisability of this operation, when we consider the successful results which have attended it, and the limited danger to life which it involves, compared with complete extirpation.

There are two questions to be considered always in these cases: the first, and most important, of course, is the arrest of the disease; the second is the comfort of the patient while life lasts. While, therefore, the resection may not completely eradicate the disease, and recurrence will probably take place, it must be borne in mind that we have by the operation added many months of comparative comfort to the life of the patient.

When recurrence takes place after resection, the further question of total extirpation of the organ is one that can only be decided according to the special indications in each particular case, and more, perhaps, according to the wishes of the patient. Any surgeon who urges or advises an operation the observed fatality of which is over ninety per cent certainly assumes a very weighty responsibility.

Section III.

External Surgery of the Throat.

External Surgery of the Throat.

Under this heading we discuss the various surgical procedures which are performed for the purpose of obtaining access to the pharynx, larynx, and trachea, and which necessitate cutaneous incision. These are: *First*, pharyngotomy, under which term we describe subhyoid pharyngotomy, and the various methods of performing lateral pharyngotomy both with and without bony section; *second*, thyrotomy; *third*, tracheotomy, under which designation we include all the artificial openings into the larynx and trachea which are performed for the relief of dyspnœic symptoms; these are: crico-thyroid laryngotomy, supra-thyroid tracheotomy, and infra-thyroid tracheotomy; and *fourth*, laryngectomy, including excision and resection of the larynx.

CHAPTER XLVII.

PHARYNGOTOMY.

In the very large majority of cases when the removal of a tumor or a foreign body from the pharynx becomes necessary, sufficient access for manipulative purposes is afforded through the natural passages. When a wide opening is required, it is a well-recognized surgical procedure, which involves no serious complications to enlarge the oral opening by an incision through the cheek, extending from the angle of the mouth to the anterior border of the masseter muscle. When tumors are of large size and extensive attachments, one of the more complicated operations will become necessary.

Subhyoid Pharyngotomy. (*See colored plate.*)

This rather ingenious operation for obtaining access to the lower portion of the pharynx, the orifice of the œsophagus, and the entrance of the larynx seems to have been proposed both by Mal-

gaigne[1] and Vidal de Cassis[2] at about the same time, although the latter[3] asserts that he first proposed the method as early as 1826, for submucous laryngitis. It was previously done on one of the lower animals, however, by Bichat,[4] for experimental purposes, and was first put into practice on the human subject by Dr. Prat,[5] of the French navy, who successfully removed a large fibrous tumor from the supraglottic portion of the larynx by this method. Since this time it has been performed by a number of surgeons, and is particularly indicated in growths situated low down on the pharyngeal wall, and may be resorted to in supraglottic tumors of the larynx not easily removable through the natural passages. It affords a free and direct approach to the lower portion of the pharynx, and yet the laryngeal mirror renders this region quite accessible for examination and manipulation. In the case in which the operation was first done by Prat the tumor in our day would undoubtedly have been extirpated by laryngoscopic methods. It is only those cases of benign tumors, therefore, which involve unusual difficulties of manipulation, which call for the external incision, such as a broadly sessile growth perhaps, or one whose base encroaches upon the orifice of the œsophagus. A malignant growth also may necessitate the wider access and more direct manipulation which this operation affords; thus, Iversen[6] performed it in a number of cases of carcinoma in this region. It may also be indicated for growths in the pyriform sinuses.

The Operation.—The patient should be placed on a table, with the shoulders elevated, as in tracheotomy, the head being bent backward as far as possible. A transverse incision through the integument is made about one-third of an inch below the lower border of the hyoid bone, extending from the anterior border of the sterno-mastoid muscle on one side to a similar point on the opposite side (see Fig. 105). Beneath the skin we come upon the superficial fascia, in which courses the anterior and occasionally the external jugular veins. These are to be included between two double ligatures, and severed. Beneath the superficial fascia the sterno-hyoid muscles are met with in the median line, one on either side, and cut through, and, beneath, the thyro-hyoid muscles, which are treated in the same manner. The thyro-hyoid membrane is then reached, dense in the median line, but

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[1] "Manuel de Méd. operat.," Paris, 1835.

[2] Cited by Velpeau: "Nouveaux Éléments de Méd. operat.," Paris, 1833.

[3] "Traité de Path. externe," Paris, 1861, vol. iii., p. 748.

[4] "Traité d'Anat. déscriptif," Paris, 1819, vol. ii., p. 402.

[5] Gaz. des Hôpit., Paris, 1859, No. 103.

[6] Arch. für klin. Chir., 1885, vol. xxxi., p. 610.

becoming more attenuated laterally. The wound should be now explored by the thumb and index finger, and the attempt made to ascertain the position of the epiglottis. When this is found, the thyro-hyoid membrane and the pharyngeal mucous membrane which is beneath it should be incised at the side of the epiglottis, and the incision carried directly through to the opposite side, care being taken to avoid wounding either the epiglottis or its attachments. The crest of the epiglottis is now seized and drawn out through the wound, when a stout thread should be passed through it and a loop formed; it is then drawn downward and forward by an assistant in such a way as to leave wide and free

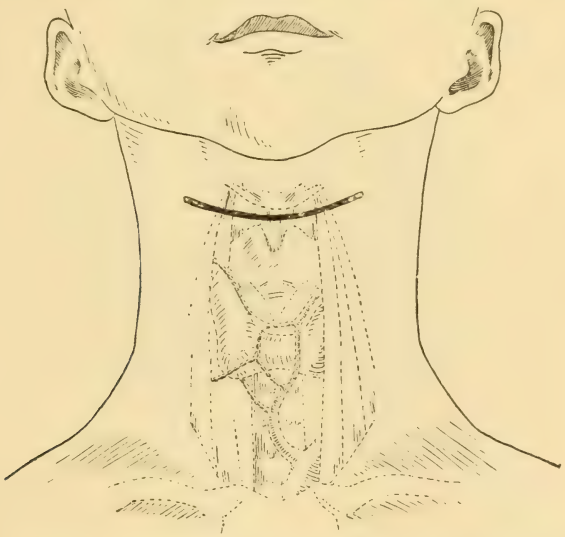

FIG. 105.—The Cutaneous Incision in Subhyoid Pharyngotomy, and the Relation of the Deeper Parts.

access to the pharyngeal cavity. If now, on direct examination and palpation of the growth which has called for the operation, it is found to extend downward into the œsophagus, a special advantage of the procedure lies in the fact that more space can be gained by extending the end of the incision on one or the other side down along the border of the sterno-mastoid muscle, in such a way as to convert the procedure practically into a lateral pharyngotomy, or, more correctly perhaps, an œsophagotomy.

After the growth has been removed, the wound is closed by inserting catgut sutures into the thyro-hyoid membrane and the severed muscles, and finally bringing together the cutaneous flaps and treating them in a similar manner.

The patient should now be restricted to rectal alimentation for at least forty-eight hours.

Lateral Pharyngotomy. (*See colored plate.*)

Without attempting any definite classification of the various procedures which are included under this term, we simply describe the methods which have been resorted to by different surgeons in special cases.

Langenbeck's Method.[1]—This operator reports three instances of malignant disease of the pharynx in which the following operation was resorted to:

A curved incision (see Fig. 106) is made through the integument, which commencing at the lower border of the inferior maxilla, mid-

Fig. 106.—Line of Cutaneous Incision in Lateral Pharyngotomy (Langenbeck's Method).

way between the chin and angle, then passes downward to the superior cornu of the hyoid bone, and along the anterior border of the sterno-mastoid muscle to a point opposite the cricoid ring, or lower if necessary. Immediately beneath the integument the platysma muscle, lying in the superficial fascia, is divided. Beneath this is found the deep cervical fascia, which is to be incised with some care, especially in the upper portion, where important vessels and nerves may be encountered. In the lower portion of the wound, however, the only vessel which may be met with is the superior thyroid; this should be avoided, while the sheath of the great vessels is retracted. Beneath the deep fascia in the upper

[1] Arch. für klin. Chir., vol. xxiv., p. 825.

portion of the wound the submaxillary gland is seen and pushed to one side, when the hyo-glossus muscle comes into view, and is severed, and the lingual artery, which courses beneath it, sought for and ligated. After this, the stylo-hyoid and digastric muscles are severed and the greater cornu of the hyoid bone is found, beneath which lies the pharyngeal aponeurosis, which, being incised, with the mucous membrane beneath it, the pharyngeal cavity is reached. When the pharynx is opened, the incisions through its lateral wall may be extended as far up as the base of the tongue and down to the orifice of the œsophagus, thus obtaining a wide access to this region for the carrying out of the indications for

FIG. 107.—Line of Cutaneous Incision in Lateral Pharyngotomy (Bergmann's Method).

which the operation is done. This method is especially valuable for the removal of tumors involving the lower portion of the pharynx and even extending into the œsophagus, in that this latter structure can be opened through a considerable portion of its upper extremity. Moreover, by strongly retracting the anterior flap, the posterior wall of the larynx is brought thoroughly within reach; and where this has been invaded by the morbid process, its resection is easily accomplished.

BERGMANN'S METHOD.[1]—In several cases where malignant disease involved not only the pharynx, but extended somewhat to the base of the tongue, Bergmann performed the following operation:

[1] Deutsche med. Woch., 1883, p. 605.

A curved incision, with its convexity outward (see Fig. 107), is carried backward from the angle of the mouth, across a point near the angle of the jaw, and downward over the superior cornu of the hyoid bone and along the anterior border of the sterno-mastoid muscle to a point opposite the thyroid cartilage, or lower if necessary. After the integument and superficial fascia are cut through, the facial artery should be sought for and ligated, after which, the muscles of the cheek being divided, the lower portion of the wound is deepened and the lingual artery ligated in the manner already described in Langenbeck's operation. The ramus of the jaw is now sawn through in the line of the cutaneous incision. The

FIG. 108.—Line of Cutaneous Incision in Lateral Pharyngotomy (Küster's Method).

mucous membrane is then incised from the angle of the mouth, backward and downward to the pharyngeal cavity. In this manner a wide and continuous access is obtained to the whole of the cavity of the mouth and pharynx as far as the laryngeal orifice.

KÜSTER'S METHOD.[1]—In a case of malignant disease involving the pharynx, palate and faucial pillars, this surgeon performed the following operation:

A cutaneous incision, commencing at the angle of the mouth was carried backward across the angle of the jaw to the anterior border of the sterno-mastoid muscle (see Fig. 108). The cheek

[1] Deutsche med Woch., 1885, p. 860.

was completely cut through, some small branches of the facial artery being encountered and ligated; the ramus of the jaw was then exposed and sawed through in the line of the incision. The upper fragment was then disarticulated and removed. The incision was carried through the mucous membrane back as far as the border of the sterno-mastoid muscle. By depressing the jaw and retracting the upper flap, abundant access was obtained to the faucial region and cavity of the pharynx.

The same surgeon suggests that, in case the disease extends downward toward the œsophagus, the horizontal incision might be made from the corner of the mouth to the angle of the jaw and

FIG. 109.—Line of Cutaneous Incision in Lateral Pharyngotomy (Mickulicz's Method).

then continued vertically downward to the border of the sterno-mastoid muscle, the upper fragment of the jaw being removed in the same manner as in his first operation.

MICKULICZ'S METHOD.[1]—In this operation an incision is made through the integument of the side of the neck, extending from the mastoid process along the anterior border of the sterno-mastoid muscle down as far as the thyroid cartilage (see Fig. 109). The integument and superficial fascia being cut through, the deep fascia is reached, after which the dissection should be made with exceeding great care. Beneath this we come upon the great vessels, which are to be retracted. The facial artery should now be sought

[1] Deutsche med. Woch., 1884, p. 33.

for and ligated, and the hypo-glossal nerve carefully avoided. The anterior flap is retracted, and the angle of the jaw sought for and cleared. The periosteum of the ascending ramus is carefully separated, care being taken to preserve the insertion of the pterygoid muscles. The ramus is then sawn through and disarticulated. The lower portion of the incision is now deepened, the posterior belly of the digastric muscle divided, the stylo-hyoid drawn forward, and the lateral wall of the pharynx thus reached, which is now opened in its whole extent from a point opposite the soft palate down as far as the œsophageal entrance, if necessary.

Fig. 110.—Line of Cutaneous Incision in Lateral Pharyngotomy (Cheever's Method).

Cheever's Method.[1]—In a case of encephaloid tumor of the tonsil, this operator opened the pharynx after the manner already described in Mickulicz's operation, with the exception that the ramus of the jaw was not resected and a little wider retraction of the flaps was obtained by making, in addition to the longitudinal cutaneous incision, a horizontal incision extending forward along the body of the inferior maxilla (see Fig. 110).

In a second case[2] of malignant disease of the tonsil operated upon by the same surgeon, the incision was carried from the angle of the mouth backward in a straight line across the ramus of the jaw to the anterior border of the sterno-mastoid muscle. The

[1] Reports of the Boston City Hospital, 1870, p. 390.

[2] Boston Medical and Surgical Journal, 1878, vol. xcix., p. 133.

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ramus was then sawed through and the fragments separated. An incision was then made through the mucous membrane, extending backward through the whole extent of the cutaneous incision.

POLAILLON'S METHOD.[1]—This surgeon, in order to gain access to a malignant tumor of the tonsil, incised the cheek from the

FIG. 111.—Line of Cutaneous Incision in Lateral Pharyngotomy (Polaillon's Method).

angle of the mouth backward, and extended his cutaneous incision across the inferior maxilla as far as the anterior border of the sterno-mastoid muscle. A segment of the ascending ramus of the jaw was excised, and then the cutaneous incision was extended downward along the anterior border of the sterno-mastoid muscle (see Fig. 111). The incision through the mucous membrane thus extended from the mouth in a straight line to the pharyngeal wall and subsequently down to the orifice of the œsophagus.

[1] Gaz. des Hôpit., 1883, vol. lvi., p. 266.

CHAPTER XLVIII.

THYROTOMY.

[*See colored plate.*]

When we consider that the operation of laryngo-fissure is a somewhat simple procedure, and practically unattended with danger, it seems rather a curious fact that it was not resorted to at a much earlier date; and yet, while its feasibility was suggested by Desault[1] as early as 1812, it does not seem to have been performed until 1833, when it was done for the first time by Brauers,[2] of Louvain, who thus gained access to the cavity of the larynx for cauterizing a growth, although he did not extirpate the tumor. It was subsequently performed by Ehrmann,[3] of Strassbourg, who successfully removed a papilloma by this method some ten years later. Later operations were done by Gurdon Buck[4] in 1851 for malignant disease, and by the same operator[5] again in 1861 for fleshy granulation, and about the same time by Sands[6] for carcinoma, and also by Rauchfuss.[7] The infrequency of the resort to this procedure before the days of laryngoscopy is easily explained by the inability to make a definite diagnosis of intra-laryngeal conditions, and hence the failure to establish clear indications for opening the larynx. As soon, however, as laryngoscopy had brought the upper air tract under direct ocular inspection, the operation immediately became one of recognized availability and of frequent resort.

Indications.—This operation is usually done for the removal of tumors in the cavity of the larynx; in rare instances it may be indicated in the cases of foreign bodies in this cavity, and possibly for cicatricial stenosis or other morbid conditions. Hope[8] has suggested its availability for the purpose of removing a portion of the vocal cords in cases of abductor paralysis, to re-establish impeded respiration, although, as far as I know, thyrotomy has never been done for this purpose.

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[1] "Œuvres chirurgicales," par Bichat, Paris, 1811, vol. ii., p. 255.
[2] Jour. der Chirurgie von Graefe und Walther, 1834, vol. xvi., p. 534.
[3] "Histoire des Polypes du Larynx," Strassbourg, 1850.
[4] Trans. of the Amer. Med. Ass'n, 1853, p. 509.
[5] Arch. für klin. Chir., vol. viii., p. 520.
[6] New York Med. Jour., 1865, vol. i., p. 110.
[7] St. Petersburger med. Zeit., 1862, vol. iii., p. 153.
[8] New York Med. Jour., Nov. 20th, 1886.

It is difficult to lay down any definite rule as to when the larynx should be opened for the removal of intra-laryngeal tumors; in each case the decision must be based on the special features which present, and also perhaps on the manipulative skill of the surgeon. Where a tumor can be thoroughly extirpated through the natural passages without involving any danger of permanent injury to the soft parts, there can be of course no question as to the propriety of such procedure. If the tumor is of large size and has a broad base, or if it is attached beneath the cords, or in any other position which renders it not easily within the reach of the laryngeal forceps, there should be no hesitancy in opening the larynx, in preference to subjecting the patient to the dangers which the intra-laryngeal method

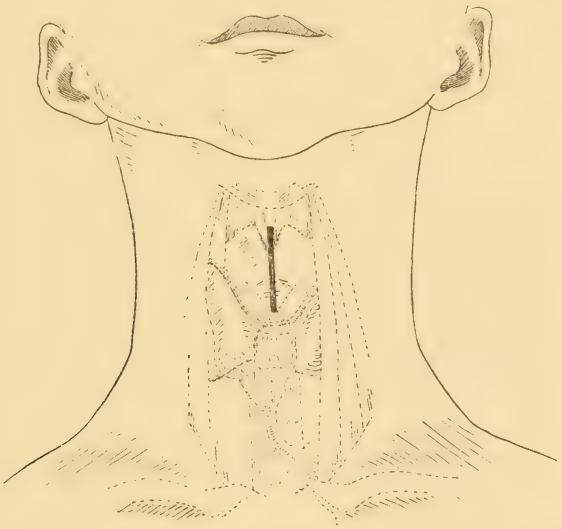

FIG. 112.—Cutaneous Incision in Thyrotomy, and its Relation to the Underlying Structures.

might entail. This question, however, has already been somewhat fully discussed in a previous chapter, as well as the dangers which the operation entails upon the functional integrity of the vocal apparatus, and hence need not be entered upon here.

The Operation.—The incision is made through the integument in the median line, extending from immediately above the thyroid notch to the cricoid ring. The integument being retracted, and the small amount of areolar tissue which is found in this region being pushed aside by the handle of the scalpel, the thyroid cartilage is brought immediately into view. This should be thoroughly cleared and its extent in the median line recognized, both by the contour of the parts, and the position of the thyroid notch, when with a stout sharp scalpel a superficial incision is made extending

throughout its whole length. This is slowly deepened by successive strokes of the knife until the mucous membrane is reached. In late adult life this cartilage is liable to be the seat of ossification, which will necessitate the use of a small saw or the cutting forceps. The mucous membrane should be thoroughly exposed by a complete section of the cartilage before it is cut or the larynx penetrated, in that the irritation and hemorrhage are liable to cause a troublesome cough, by which subsequent manipulations may be hampered. The constant effort should be to confine the incisions exactly to the median line: this is of especial importance in incising the mucous membrane, in that a deviation from the median line at this step of the operation would involve the wounding of one of the vocal cords. In order to avoid this, it is well to make the incision from below upward by means of a curved, sharp-pointed bistoury, the fragments of the cartilage being held apart by means of hooks in the hands of an assistant. A short incision is made first, when the subglottic tissues and under-surface of the vocal cords are brought into view, provided a strong light is used, and this operation should always be done, I think, with the aid of the concave forehead mirror. As soon as the vocal cords are seen, the knife can be so directed as to complete the incision of the mucous membrane directly between the anterior insertion of the cords. In making the cartilaginous section, it is well to leave a small portion of the cartilage at the upper extremity of the incision undivided, to provide for the more perfect coaptation of the parts after the completion of the operation. If a sufficiently roomy access to the laryngeal cavity is not obtained in this way, it may be necessary to complete the section, in order that the halves of the divided cartilage may be drawn further apart.

As gaining still larger access, it may occasionally be wise to make a transverse incision through the crico-thyroid membrane at the lower border of the thyroid cartilage. When cutting in this region, of course the position of the crico-thyroid artery should always be borne in mind, crossing the upper portion of this membrane.

The cavity of the larynx being now opened, the neoplasm is brought into view, and removed by such measures as may seem most suitable. Ordinarily, I think, the cold-wire snare, or for a very small growth the ordinary aural snare, should be resorted to, as securing the detachment of the tumor with the least amount of hemorrhage. I cannot agree with Mackenzie[1] in considering this operation as "a very serious one as regards the danger to life,"

[1] "Diseases of the Throat and Nose," Amer. ed., Philadelphia, 1880, vol. i., p. 238.

for in itself it involves no very grave menace to life, nor is it liable to be attended with grave complications, although both these conditions may develop from the morbid process which has called for its performance. As Mackenzie states, the operation may possibly be followed by pleurisy, pneumonia, or metastatic abscess of the lungs; but these complications are the somewhat remote dangers of any artificial opening of the air tract. The most troublesome complication which may arise is that of hemorrhage. A number of instances have been reported in which this was excessive: thus, in one case Fauvel[1] states that thirty-eight ligatures were required, without, however, giving any further details. As a rule, the hemorrhage arises in the extirpation of the neoplasm, and not from the thyrotomy incisions. When we consider that the larynx is only opened for growths of large size and those not accessible by intralaryngeal methods, the danger of hemorrhage can scarcely be considered an efficient argument against the performance of thyrotomy, although both Fauvel and Mackenzie seem to take rather strong grounds against it. The hemorrhage which occurs at the time of the operation is not excessive, and usually can be controlled by pressure or, if necessary, by ligatures. The slow trickling or perhaps secondary hemorrhage, which occasionally occurs later, is liable to be more troublesome even than the primary bleeding. This is best controlled by thorough cauterization of the base of the tumor, either by the galvano-cautery, nitrate of silver, or chromic acid. Of these the former is probably the best hemostatic, if used at a dull red heat.

It is by no means an easy matter in these operations, especially in young children, to thoroughly recognize the regional anatomy of the laryngeal cavity when opened in this manner. This is especially true while the neoplasm is in position. After the growth as been removed, however, the false cords and ventricular openings should be easily recognized. Perhaps as valuable a landmark as any will be found in the arytenoid cartilages, which when the growth is removed can be seen in the deepest portion of the opening, moving rhythmically with the respiratory act. Their recognition enables the operator more intelligently to explore the cavity, and to verify the success of the operation in the complete removal of every trace of the neoplasm.

After the growth has been extirpated, the cartilaginous structures are brought again into as perfect apposition as is feasible, and secured in place by sutures. In a child these should be of silkworm gut, as they are to be left *in situ*. The integument is then brought together and secured above them.

[1] "Traité prat. des Mal. du Larynx," Paris, 1876, p. 229.

The decision of the question of a preliminary tracheotomy is one which will be based largely upon the character of the affection which calls for the thyrotomy. If the tumor is of small size, and presents a fair prospect of allowing of extirpation without much hemorrhage, it will probably be safe to open directly into the larynx without previously inserting a tracheal canula. In most instances, however, this latter procedure will be demanded, and whether absolutely necessary or not, it certainly adds much to the sense of security with which the surgeon will operate; moreover, his manipulation is notably aided by abolishing for the time being the respiratory function of the larynx, by temporarily establishing a new channel for the air current below. Practically, then, I think, thyrotomy without a preliminary tracheotomy is only to be attempted in cases of small growths which are so situated that they cannot be removed through the natural passages. If the operation is done for the removal of a foreign body, or for cicatricial stenosis, or other morbid condition, this question will depend largely on the extent of the dyspnœa which exists.

It is generally advised to delay the thyrotomy for some days after the insertion of a canula, in order that the patient shall become habituated to the wearing of the tube. I know of no good reason why the two operations should not be done at the same time, as the shock from both procedures combined can scarcely react on the general system to such an extent as to seriously complicate or imperil the ultimate result.

CHAPTER XLIX.

TRACHEOTOMY.

[*See colored plate.*]

In the older literature the bronchus was described as the middle portion of the *arteria aspera* or windpipe, hence the term bronchotomy was generally used to describe an artificial incision into the trachea for the relief of dyspnœa. At the present time we use the term tracheotomy, as a somewhat generic expression, to describe the various operations which are done for this purpose, whether the immediate site of the incision be the laryngeal cartilages or the tracheal rings.

Although the first operation of this kind was done, nearly two thousand years ago, by Asclepiades [1] in a case of quinsy, the propriety of its performance seems to have been the subject of a somewhat animated discussion up to comparatively recent times: thus it was condemned by Aretæus [2] in the first century, and Cœlius Aurelianus [3] in the fourth, on the ground that the severed cartilages would not reunite. It was indorsed, on the other hand, by Antyllus, a contemporary of the latter, who first gave an accurate description of the method of its performance; and was repeatedly resorted to by Paul of Ægina in the seventh century. Antyllus seems to have entertained the same prejudice against cartilaginous incisions as the earlier surgeons, as he directs, in order to avoid this, that the section be made transversely between the third and fourth rings of the trachea. During the succeeding eight centuries the operation seems to have fallen into disuse, for, although it is referred to by Avicenna,[4] Abulcasim, and Avenzoar,[5] they had not sufficient daring to attempt its performance on a human subject, although the latter performed a successful tracheotomy on a goat. Avicenna, in recommending the operation as a last resort in violent quinsies, designates it as "*scissio cannæ*," from which arose the absurd expression "subscannation," a term which, according to Fabri-

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[1] Cited by Galen: "In Medico," chap. xiii.

[2] Aretæ "Curat. Acutar.," book i., chap. vii.

[3] "De Acut. Morb.," iii., chap. iv.

[4] Lib. iii., Fen. 9, tract i., cap. ii., Venetiis, 1608.

[5] Cited by Friend: "History of Medicine from Galen to the Sixteenth Century," London, 1750, vol. ii., p. 94.

cius,[1] frightened the surgeons of his day. During the fifteenth and sixteenth centuries we find the operation again exciting attention, and recommended and occasionally performed by such observers as Houllier,[2] Casserius,[3] Benivieni,[4] Brassavole de Ferrara,[5] and others.

Up to this time no device seems to have been used for keeping open the tracheal wound, the whole attention of these surgeons being engrossed by the supposed danger of the cartilages not reuniting. Very minute directions are given and special medicaments advised for securing a healing of the wound. In the latter part of the sixteenth century, Sanatorius[6] operated with a trocar and canula, leaving the tube in position for breathing purposes. The first to insert a specially devised tube was Fabricius,[7] who constructed a canula, with flanges or wings arranged in such a way that all danger of its falling into the trachea was avoided. It was a short, straight tube, which was intended only to reach as far as the inner edge of the tracheal opening. This surgeon also seems to have arrived at the conclusion that the cartilaginous section was attended with no danger, in that he made a vertical incision through the tracheal rings. Casserius,[8] a pupil of the former, made an important improvement in the tube by curving it to the arc of a quadrant, and attaching tapes to the flanges in such a way that it could be secured *in situ*. The somewhat vigorous criticism by Fabricius of the curved tube, on the ground that it would prove irritating and excite ulceration and cough, seems not to have been well taken.

Notwithstanding the fact that the essential details of the procedure were thus completed, it seems still to have met with considerable opposition, and was but rarely resorted to in the seventeenth and eighteenth centuries, although Habicot[9] performed it but only in cases of laryngeal obstruction and foreign bodies; while Severinus[10] and Moreau[11] resorted to it in cases of mumps, the latter referring to the operation as a "divine invention." Detharding[12] recommended it in cases of drowning. It was still further indorsed by Serrier,[13] Scultetus,[14] Juncker,[15] and Dionis.[16] The latter suggested the advisability of rapid operation by a single puncture with the

[1] "Operat. Chirurg.," chap. xliv. [2] "De Morbis Internis," cap. xxii.
[3] "De Laryngotomia," cap. xx. "De Laryngis Vocis Organi Structurâ," lib. i.
[4] "De Abditis morborum," etc., Basil, 1528. [5] Cited by Casserius: Op. cit.
[6] "Opera Chirurgica," Francof., 1620. [7] Op. cit.
[8] Op. cit. [9] "Sur le Bronchotomie," Paris, 1620.
[10] "De Medicina Efficac.," etc., pt. 2, chap. xl., p. 93.
[11] "Epist. de Laryngot.," 1646. [12] Haller's "Disput. Chirurg.," vol. ii., p. 419.
[13] "Med. Obs.," 1673. [14] "Armament. Chirurg.," Lugdun. Batav., 1693, p. 130.
[15] "De Operat. in Collo," tab. xciv. [16] "Operatio," 8th ed., Paris, 1777, p. 379.

knife, although previously the use of the trocar had been advised by both Verduc[1] and Dekkers.[2] Among those who opposed the operation during this period may be mentioned Van Swieten,[3] Lazarus Riverius,[4] Garengeot,[5] and others. About this time, Heister[6] first used the name "tracheotomy" to describe the operation, and a notable improvement in the *technique* of the procedure was made by Martin[7] in the introduction of a double tube.

During this period tracheotomy does not seem to have been much resorted to in acute affections of the larynx, but was in most instances performed for the relief of such affections as quinsy, bronchocele, and foreign bodies in the larynx. The very elaborate memoirs of Louis,[8] in advocacy of this measure in the latter condition, are worthy of special note, especially for the thoroughness with which the subject was discussed in every detail, and the success with which the safety and availability of the operation were demonstrated. In the latter part of the eighteenth century we find tracheotomy recommended in croup by Home,[9] Crawford,[10] and others. In 1825 Bretonneau, during his famous investigations of diphtheria, recognizing the indications for opening the trachea, performed the operation in a number of cases, without success, however, although he finally met with a favorable result in a single case. In 1833, Trousseau,[11] having demonstrated its success in his own practice, gave it the indorsement of a name which carries such weight of authority that from this date it has received general acceptance, as a procedure not only unattended with serious dangers in itself, but as available in all cases where suffocative symptoms develop from any obstructive lesion in the larynx or parts above.

THE TUBE.—Fabricius, as we have seen, was the first to suggest the fitting of a canula in the tracheal wound in bronchotomy, his instrument being a short, straight tube, which simply reached the tracheal wall. Casserius extended it farther into the trachea in the form of a curved tube, while Martin overcame the difficulty of the calibre of the instrument becoming occluded by constructing a double canula. This instrument had a movable collar, to which tapes, passing around the neck, were attached for holding it *in situ*. Martin's canula seems to have been the instrument in gen-

[1] "Opérat. de Chirurg.," Paris, 1703.
[2] "Exercitationes Practicæ," Lugd. Batav., 1695.
[3] "Comment. in Aphor. Boerhaav."
[4] "The Practice of Physick," London, 1678, Book vi., p. 145.
[5] "Opérat. de Chirurg.," Paris, 1720, vol. i., p. 491.
[6] "System of Surgery," London, 1743, pt. 2, chap. 102.
[7] Philosophical Trans., 1730, vol. vi.
[8] Mem. Acad. Surg., Sydenham Society Pub., London, 1848, pp. 214 and 256.
[9] "An Enquiry into the Nature, Causes, and Cure of Croup," February, 1765.
[10] "Dissert. de Cynanche Stridulus," Edinburgh, 1771. [11] Clinique médicale.

eral use up to quite a recent time. It will be easily seen how the movements of the neck would cause the distal end of the tube to impinge upon the tracheal wall in such a way as to cause no little irritation; this suggested to Roget[1] the device of attaching the tube to the cervical plate by a movable joint, by which this objection was obviated. This is the model on which the canula at present in general use is constructed. Its mechanism, which is illustrated in Fig. 113, is familiar to all, and need not be described. This is the tube generally known as Trousseau's.

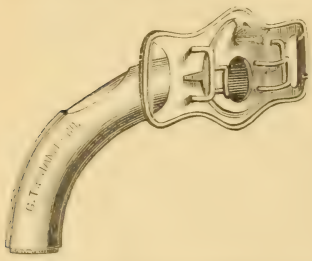


Fig. 113.—Trousseau's Tracheal Tube.

An oval opening is ordinarily made on the upper side of the curved portion of the tube, opposite the lumen of the upper segment of the trachea; this is designed to admit of the passage of air for respiratory purposes when the inner tube is withdrawn.

A very serious objection to this fenestra lies in the fact that the tissues are apt to pouch into the opening and become eroded; and in several instances I have seen exceedingly troublesome hemorrhages arise from this source. The object of the fenestra, of course, is to enable the patient by closing the mouth of the tube to force air through the larynx, either for phonatory purposes, or to test the patency of this organ. Ordinarily there is sufficient space between the periphery of the tube and the tracheal wall to admit of this; hence the fenestra of the tube is not to be regarded as a commendable device in all cases.

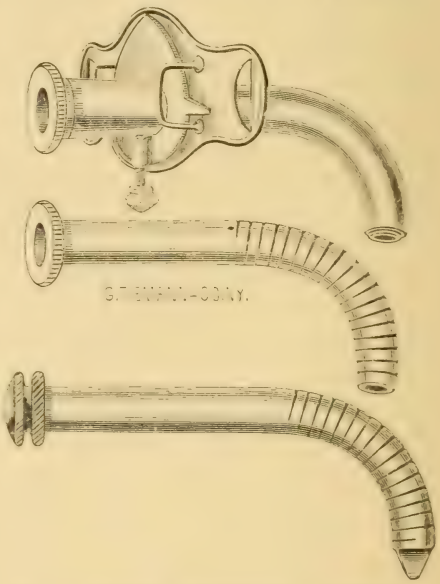


Fig. 114.—Durham's Tracheal Tube. Showing the lobster-tail inner tube and the pilot trocar.

The ordinary tube is curved to the arc of a quadrant, and for this reason cannot adapt itself to the varying thickness of the cervical tissues. To obviate this difficulty, Durham[2] has constructed the exceedingly ingenious device shown in Fig. 114. The improved

[1] Arch. générales de Méd., 1859.

[2] Practitioner, London, April, 1869.

feature of this tube consists in making that portion of it which lies in the wound straight, while the tracheal end is bent somewhat abruptly to a right angle; at the same time, in order to adapt it to the varying depth of the trachea beneath the integument, it is so arranged that the position of the neck plate can be changed, thus altering the length of that portion of the tube which is in the wound, and adapting it for any special case. When the neck plate is properly adjusted to the cutaneous surface, it is fixed by a screw. Of course this short curve in the tube demands that the inner canula, in order to permit of removal and insertion, shall be flexible. This is accomplished by constructing the tracheal end of the inner tube with lobster-tail joints, as shown in the figure. It is also supplied with a pilot trocar with a jointed extremity, to facilitate its introduction. Theoretically, Durham's tube is a great improvement on the ordinary form: its advantage lies in the fact that in the movements of deglutition the whole tube moves upward in the axis of the trachea, carrying with it the tracheal end, which is thus prevented from tilting against the posterior wall, which so often becomes a source of irritation or ulceration with the ordinary form of canula. The movable neck plate renders it possible to nicely adapt the tube to the varying thickness of the cervical tissues, and to adjust its proximal opening to the axis of the trachea. The jointed inner canula presents crevices for the lodgement of mucus, hence it is somewhat liable to become clogged; there is also a danger that the segments may become detached and drop into the trachea. Moreover, the removal and reinsertion of the outer tube after the wound in the neck has closed around it, is attended with a distention of the parts, which renders it necessary to crowd the tissues to such an extent that hemorrhage may be excited. With the Roget tube, by passing it exactly in the line of the circle of which it forms a quadrant, no lateral pressure whatever is exerted, and the tube is removed and reintroduced with perfect ease, and without causing pain or hemorrhage. With the Durham tube, on the other hand, which is passed through a straight opening until it reaches the trachea, its convexity crowds upon the upper wall, while its tracheal extremity scrapes along the floor of the wound till it reaches its position.

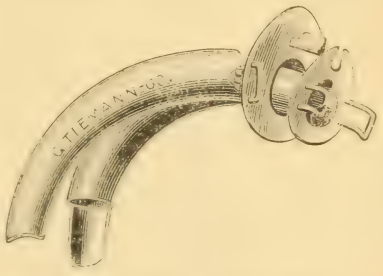


FIG. 115.—Fuller's Tracheal Tube.

Fuller[1] has devised an instrument in which the outer tube con-

[1] Med.-Chir. Trans., vol. xl., p. 69.

sists of two lateral convex plates attached firmly to the neck plate (see Fig. 115). The supposed advantage of this device is that, by pressing the plates together, the point of the instrument is reduced to a minimum, thus facilitating its insertion into the tracheal opening. These plates are subsequently forced apart by the insertion of the inner tube. Gendron[1] has devised a similar instrument, in which the lateral segments of the outer tube are separated by means of a screw fixed to the outer plate. These devices possess no especial advantages, and, moreover, the edges of the segments are liable to cause erosion of the tissues in the wound. In Fig. 116 is shown an instrument devised by Koenig,[2] for cases where the respiratory stenosis occurs low down in the trachea. The instrument is about four and a half inches long. The firmness and flexibility necessary for its introduction are secured by making its central portion of wire wound into close spiral, as seen in the illustration.

FIG. 116.—Koenig's Tube for the Relief of Tracheal Obstruction.

Where tracheotomy has been done for a syphilitic stenosis, or other chronic affection of the larynx, valves are occasionally fitted to the canula in such a way that while inspiration is effected through the tracheal opening, the expiratory current is forced through the natural passages. In Fig. 117 is shown the Luer pea valve, which is fitted to the tracheal canula. Its mechanism is easily appreciated by reference to the illustration. During inspiration the ball is lifted away from the orifice of the tube, and the inspiratory current passes easily, while during expiration it falls into the outer opening, completely closing it, thus forcing the air through the larynx.

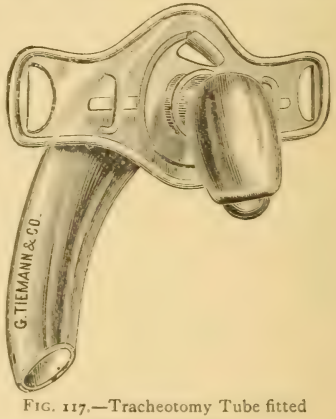


FIG. 117.—Tracheotomy Tube fitted with Luer's Valve.

[1] Linhart's "Operationslehre," 2d ed., p. 652.
[2] "Lehrbuch der speciellen Chirurgie," Berlin, 1886, p. 557.

Various devices have been constructed for rapid tracheotomy, on the principle of the canula and trocar, such as those of Garin, Thompson, Pitha, and Ullrich. I do not think this method of operating is to be commended.

Tracheal canulas are constructed of silver, aluminum, and vulcanite. The metal tube should in all cases be preferred, for, while the vulcanite canula is cheaper, it is fragile and brittle, and there is always the danger of a fracture in the effort to withdraw an inner tube which has become fixed by dried mucus; moreover, the calibre of these tubes is not as large in proportion to the outer diameter as in the metal instruments.

As regards the tube to be used in any given case, the following table indicates the sizes admissible for the various ages:

For a child under three years the inner calibre of the tube should be $\frac{3}{16}$ inch.

From	3	to	6	years,	.	.	.	.	$\frac{4}{16}$ inch.
"	6	"	9	"	.	.	.	.	$\frac{5}{16}$ "
"	9	"	12	"	.	.	.	.	$\frac{6}{16}$ "
"	12	"	20	"	.	.	.	.	$\frac{7}{16}$ "

The largest-sized tube which is supplied by the instrument makers has a calibre of a half-inch. This is very rarely used, however.

INSTRUMENTS.—The instruments required for operating are: a sharp scalpel or bistoury; two hooks, either blunt or sharp-pointed, for separating the edges of the wound; a sharp hook for fixing the trachea; a grooved director; and two pairs of ordinary thumb forceps. In addition to these, it is well to have within reach a number of artery clamps, an aneurism needle, curved and straight blunt-pointed scissors, silk and catgut ligatures of assorted sizes, and curved and straight needles.

INDICATIONS.—An artificial opening into the trachea is indicated by any condition, whether acute or chronic, which produces narrowing of the normal lumen of the larynx and thereby interferes with respiration, provided that this stenosis is sufficient to endanger life.

Among the diseases which may demand the operation may be enumerated: œdema of the larynx, acute submucous laryngitis, acute and chronic subglottic laryngitis, syphilitic and tubercular laryngitis, neoplasms of the larynx, foreign bodies in the larynx, fracture of the larynx, double abductor paralysis; and spasm of the larynx in children and, in rare instances, in adult life. It also may be demanded to gain access to foreign bodies in the trachea

or bronchial tubes, and as preliminary to laryngotomy, laryngectomy, and other operations upon the upper air tract.

The special indications for the operation in these various affections have already been sufficiently discussed, and need not be entered upon here, further than to repeat what has already been stated, that in all cases of laryngeal stenosis it should be borne in mind that a long continuance of this condition is liable to develop a weakness of vasomotor control in the blood-vessels of the bronchial mucous membrane, and thereby entail a danger of the sudden supervention of pulmonary œdema. On this account, as well as others, the greatest safety to the patient is secured by an early resort to the insertion of a tracheal canula. Moreover, the operation in itself is not one which is attended with any very grave dangers to life, and does not usually seriously complicate the disease for the relief of which it is performed.

THE USE OF ANÆSTHETICS.—In former times the trachea, of course, was opened without anæsthesia, and at the present day this is not infrequently done where the symptoms are of such an urgent character as to demand immediate relief, without the delay necessary for the administration of the anæsthetic. If such urgency does not exist, however, I think there can be no question as to the propriety of securing that perfect relaxation and control of the patient, as well as the freedom from pain, which the anæsthetic affords.

Practically there are but three agents which need be referred to in this connection. These are: ether, chloroform, and cocaine.

Ether is exceedingly irritating to the mucous membrane of the air tract; it is liable to produce nausea and vomiting; it requires usually from ten to twenty minutes to secure perfect relaxation; the stage of excitement is frequently prolonged; and, moreover, in most cases it produces that troublesome churning movement of the larynx which proves a serious obstacle to the operator. The only argument in favor of this agent is its safety.

Chloroform, on the other hand, is unirritating to the air tract; it excites no movements in the larynx; it is rapid in its action; and it produces complete anæsthesia usually in from three to six minutes. The objection to this agent is the liability to fatal accident from cardiac syncope. Clinical experience, however, teaches us that this danger, although not entirely absent, is very much less in child life than with adults. Unless, therefore, some special contra-indication is present in the form of cardiac or other general disease, I think that this agent should be given the preference in opening the trachea in children. In my own experience this has been the only anæsthetic used, and I have in no single instance

seen any unfavorable symptoms develop from its administration.

The hypodermatic injection of twenty minims of a four-per-cent solution of cocaine into the integument immediately over the site of the cutaneous incision will produce sufficient anæsthesia to enable the surgeon to insert a tracheal tube with comparatively little pain, with the exception possibly of the last incision through the mucous membrane of the trachea. Injected in this way, the anæsthesia is maintained for from ten to twelve minutes, which ordinarily is an abundant time for completing the operation. This method, therefore, would seem to be an admirable resource where tracheotomy is demanded in adult life, especially when the tracheotomy is preliminary to some further operative interference, or in chronic cases where urgency does not exist. It scarcely need be suggested that, in operating with cocaine anæsthesia, it is a wise precaution to have chloroform or ether provided for use, in case of unexpected complications setting in which would demand either extension or prolongation of operative measures.

In conclusion, I think we may lay it down as a fairly safe rule, then, that in young children where urgency does not exist, or where the patient is not already practically anæsthetized by carbonic-acid poisoning, the operation should be done with the use of chloroform. In adult life, cocaine anæsthesia should be preferred, thus avoiding the dangers of chloroform and the discomfort and annoyance of ether.

As regards the use of the well-known hospital mixture, of one part alcohol, two parts chloroform, and three parts ether, I have had but limited experience, but am disposed to regard it as quite as irritating to the mucous membranes of the air tract as pure ether. Another method occasionally recommended is to administer chloroform until relaxation is secured, and subsequently to use ether. Chloroform anæsthesia does not prevent the unpleasant effects of ether; hence, I do not think this method is to be commended in tracheotomy.

Regional Anatomy of the Parts.—Immediately beneath the integument covering the larynx and trachea anteriorly we come upon the superficial fascia, in which courses from above downward the two anterior jugular veins, between the median line and the anterior border of the sterno-mastoid muscles, lying about two-fifths of an inch on either side of the former. Just above the sternum they communicate by a transverse trunk. They vary in size in different subjects, and one is occasionally wanting. Their division may give rise to troublesome hemorrhage. Immediately be-

neath the superficial fascia we come upon the sterno-hyoid muscles above and the sterno-thyroid muscles below, the former being in apposition over the thyroid cartilage and first and second rings of the trachea, namely, above the thyroid isthmus, while below this point the sterno-thyroid muscles are in apposition. Separating these, we come down upon the deep cervical fascia, a dense membrane which is attached to the hyoid bone above and, passing downward over the thyroid cartilage, the crico-thyroid membrane, the cricoid cartilage, and the upper rings of the trachea, arrives at the upper border of the isthmus of the thyroid gland, where it divides into two layers, one passing in front and the other behind the isthmus, to reunite on its lower border. The thyroid isthmus is usually described as lying upon the second and third rings of the trachea, although, according to Koenig,[1] in most instances in young children, it extends as high as the lower border of the cricoid cartilage. Hueter,[2] describing this portion of he deep fascia which invests the thyroid isthmus, designates it as the "laryngo-thyroid fascia," describing it as binding the isthmus to the lower part of the larynx and upon the trachea. Boese,[3] however, has demonstrated that the fascia does not bind the isthmus directly upon the trachea, but rather holds it suspended over it, for, if a transverse incision is made through the fascia above the point where it divides for enclosing the isthmus, the latter body can be easily lifted off the trachea. The practical point thus made by Boese is that, in the performance of tracheotomy above the isthmus, the tracheal rings in this way can be easily reached for incision and the insertion of a tube, without wounding the isthmus. Essentially the same point has been made by Müller.[4] A long, slender prolongation of the thyroid gland, called the pyramid, occasionally rises from the upper border of the left side of the isthmus, and may ascend along the side of the trachea as far as the hyoid bone. In rare instances this pyramid arises from the central portion of the isthmus, and is found in the median line. If found, this can easily be pushed to one side. Our main interest with the thyroid body lies in the fact that, if wounded, exceedingly troublesome hemor-

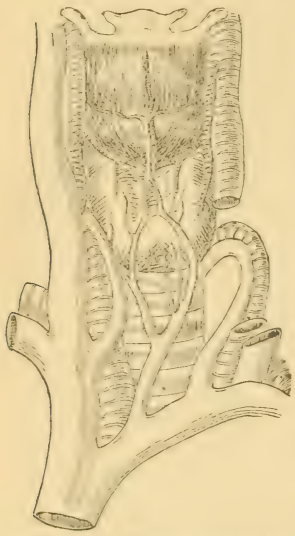


FIG. 118.—Diagram showing the Relations between the Larynx and Trachea and the Great Vessels of the Neck.

[1] Op. cit., vol. i., p. 631.
[2] Arch. für klin. Chir., vol. v., p. 319.
[3] Ibid., vol. xiv., p. 137.
[4] Ibid., vol. xii., p. 440.

rhage may ensue. The veins which are found in the deep fascia are the superior and inferior thyroid veins. Above the isthmus these are small, somewhat unimportant, and lie so far to one side of the median line that they in no way are liable to complicate an operation. Below the isthmus and immediately over the trachea, we find a somewhat close network of veins, which carry the blood from the two lobes of the thyroid gland downward to empty into the innominate vein. This is called the intra-thyroid plexus. This plexus varies greatly in size, but should always be searched for in performing low tracheotomy, and, when found, the veins clamped and ligated before incision, otherwise dividing them may give rise to exceedingly troublesome hemorrhage. Heyfelder[1] reports an instance in which death supervened from the entrance of air into these veins when severed during tracheotomy. A similar case is cited by Guersant.[2]

The only normal artery which is of importance in any of the forms of tracheotomy is the crico-thyroid, which crosses the crico-thyroid membrane. This is liable to be cut where the incisions are carried in this neighborhood. If it is borne in mind that this artery hugs somewhat closely the lower border of the thyroid cartilage, it can easily be avoided in making the incision.

Arterial Anomalies.—According to Grueber,[3] in about one case in ten a small artery, designated by Neubauer as the *arteria thyroidea ima*, runs from the arch of the aorta along the front of the trachea to the lower border of the thyroid. This anomaly has also been observed by Brault,[4] and is also probably the anomaly mentioned by Burns.[5] The possibility of its existence should be borne in mind in connection with low tracheotomy, in that its section might be attended with dangerous hemorrhage, it being about the size of a crow-quill.

The innominate artery, which normally crosses the trachea at about the level of the sternal notch, occasionally reaches so far into the cervical region as to become involved in the danger of wounding in low tracheotomy. According to Burns,[6] it may reach as high as the lower border of the thyroid gland. In a case reported by Guersant,[7] in which it was wounded during tracheotomy, the patient succumbed to secondary hemorrhage some days after; while instances in which this vessel has been found to cross the trachea at an abnormal distance above the episternal notch have

[1] Revue médicale, par Malagine, 1847, vol. ii., p. 179.
[2] Gaz. des Hôpit., 1854, p. 59.
[3] Oesterr. Jahrb., May, 1845.
[4] Gaz. des Hôpit., 1855, p. 454.
[5] "Surgical Anatomy of the Head and Neck," Amer. ed., 1823, p. 417.
[6] Op. cit., p. 415.
[7] Gaz. des Hôpit., 1854, p. 459.

been reported by Lücke,[1] Billroth,[2] and Macilvain.[3] In this latter case the position of the artery was such as to render tracheotomy impossible, and the patient died of suffocation. Five cases have been reported by Burns[4] in which both external carotids arose from the innominate artery. Thus, the left carotid necessarily crossed in front of the trachea.

SELECTION OF THE OPERATION.—In selecting the point of incision for the insertion of the tube, certain considerations are always to be borne in mind which weigh for and against each location in any given case. There are four operations which we group under the general designation of tracheotomy; these are: Crico-thyroid laryngotomy, which consists in the insertion of a tube through the crico-thyroid membrane; laryngo-tracheotomy, in which the incision is made through the cricoid ring and the first ring of the trachea; supra-thyroid tracheotomy, in which the incision is made through two or more tracheal rings above the isthmus of the thyroid gland; and infra-thyroid tracheotomy, in which the incision is made into the trachea below the thyroid isthmus. In addition to these, the incision may be made directly through the isthmus, either from necessity or, perhaps, accident, constituting what is designated as median tracheotomy. The insertion of the tube through the crico-thyroid membrane is rarely resorted to. The only consideration which weighs in its favor is the fact that cartilaginous incisions are thus avoided. Contrary to the older views, we recognize the fact now that such incisions are open to no objections. Furthermore, in this operation there is a certain danger of wounding the crico-thyroid artery.

Laryngo-tracheotomy is perhaps the operation most frequently performed, from the fact that the cricoid cartilage lies almost immediately beneath the skin, and the procedure is thus much simplified. The objection to this operation is that this cartilage may be ossified; the pressure of the tube may result in cartilaginous necrosis; and furthermore, it is to be borne in mind, if the operation is done for the relief of a diseased condition of the larynx, that the tube projects into the lower portion of this cavity, and hence its presence may aggravate the morbid process. Moreover, the insertion of the canula at this point, encroaching so closely upon the vocal cords, may give rise to subsequent vocal impairment.

In general, I think it is safe to state that those forms of trache otomy which involve incisions through the laryngeal tissues have little to commend them, possess practically no advantages over a supra-thyroid tracheotomy, and in most instances are objectionable.

[1] Arch. für klin. Chir., vol. iv., p. 589. [2] Med. Cent.-Zeit., 1859, p. 447.
[3] Graefe and Walther's Journal, vol. xxi., p. 533. [4] Loc. cit.

If, however, the thyroid isthmus be found high up on the trachea, and not easily separated and depressed, incision through the cricoid ring is not only fully warranted, but may become necessary.

The supra thyroid operation is the one to be performed probably in the large majority of instances on account of the facility with which it is done, the trachea at this point not being very deeply imbedded beneath the integument, and from the fact that it affords us a point for incision sufficiently remote from the diseased condition which demands it as to fulfil all indications.

Infra-thyroid tracheotomy is the most difficult of all the operations, from the fact that the trachea at this point is more deeply imbedded in the areolar tissue of the neck, especially in young children. Theoretically, this is the operation which should be performed in most cases. The surgeon, however, will select the higher operation in many cases, simply as avoiding the difficulties which are liable to be met with in the lower incision. If, however, the operation is done for diphtheria, it is a matter of special importance that the tube should be inserted as far away from the pseudo-membranous exudation as possible. This consideration should also operate in cases of malignant disease of the larynx.

Where the wearing of the canula is liable to become a permanent necessity, as in cases of paralysis, tumors, tertiary syphilis, or other grave and incurable laryngeal affections, it is probably the wiser course to insert the tube below the isthmus, as in this position it involves less irritation and discomfort to the patient than if inserted higher up. In bronchocele, of course, the tracheal incision should be as low down as feasible.

Median tracheotomy is never indicated, and is only done as a matter of necessity, as, for instance, where the isthmus is high up and the lower tracheal incision is contra-indicated from the presence of the arteria thyroidea ima, a high innominate artery, an anomalous course of the left carotid, or some other cause.

It is scarcely necessary to add in this connection that where the symptoms are urgent, and immediate suffocation seems threatened, the surgeon will select that operation which is performed with the greatest promptness and facility. Anatomical regions are only recognized when the operation is done with deliberation and by slow dissection. In an urgent case, therefore, these are necessarily ignored, and if the thyroid body is wounded it can scarcely be a matter for criticism.

Before making the cutaneous incision, the only point which it is necessary for the surgeon to decide upon is whether the trachea is to be opened above or below the thyroid isthmus, since the cutaneous incision for the three upper operations is the same, and

the immediate site at which the air tract shall be opened will be decided by what is found on further dissection, especially as to the position and size of the thyroid isthmus, the wiser proceeding being, of course, to insert the tube as low as possible.

THE OPERATION.—The patient should be placed on a long, narrow table, so situated as to afford the operator abundant light. The shoulders should be elevated, and the head thrown back, in order to render the integument tense and to bring into prominence the larynx and trachea as far as possible. For this purpose, a hard pillow or, better still, perhaps, a rolling-pin, around which several thicknesses of a towel have been wrapped, should be used. Two or three assistants should be present, or, better still, four—one to administer the anæsthetic, one to sponge, one to manage the instruments, and a fourth to directly assist the operator; for, although in many cases this operation is undoubtedly an exceedingly simple one, dangers and difficulties may arise at any moment which will demand quickness of decision and promptness of action, and these requirements will be better met when abundance of assistance is at hand: for I do not think that Billroth overestimates the matter when he asserts that tracheotomy is oftentimes the most difficult operation in surgery.

Before beginning the operation, the neck should be washed first with soap and water, and subsequently bathed in a corrosive sublimate solution, one part in two thousand. The instruments should be thoroughly disinfected by boiling, and placed ready for use in a tray containing a two-per-cent solution of carbolic acid.

The technique in these different operations is much the same in its successive steps, and we therefore describe the lower operation first, as involving the greater detail.

Infra-thyroid Tracheotomy. — The cervical integument being placed upon the stretch, the general regional anatomy is mapped out by ascertaining the position of the thyroid notch and the cricothyroid space, the latter being usually felt as a depression below the thyroid cartilage. If the subcutaneuous areolar tissue is scanty, each individual ring of the trachea also may be located by the touch. The cutaneous incision (see Fig. 119) is made with the scalpel, extending in the median line from the lower border of the cricoid cartilage downward toward the sternum for from an inch and a half to two inches or longer, according to the age of the patient and the apparent thickness of the areolar tissue. There is no objection to a free incision through the skin, as the facility of the operation is aided by obtaining abundant room for manipulation.

After the integument has been cut, the subsequent steps of the

operation should be done by somewhat careful dissecting, and with but limited use of the knife. The integument, together with the superficial fascia which has been cut through with the skin, is now separated by the handle of the scalpel, and the sterno-thyroid muscles brought into view, after pushing aside such areolar tissue as may present in the wound. The muscles are now separated by the handle of the scalpel, and held apart by retractors in the hands of an assistant. This brings into view the deep fascia which covers the trachea below and separates into two layers above, one passing in front and one behind the thyroid isthmus. This latter body is now recognized through the thin anterior layer of the fascia as a

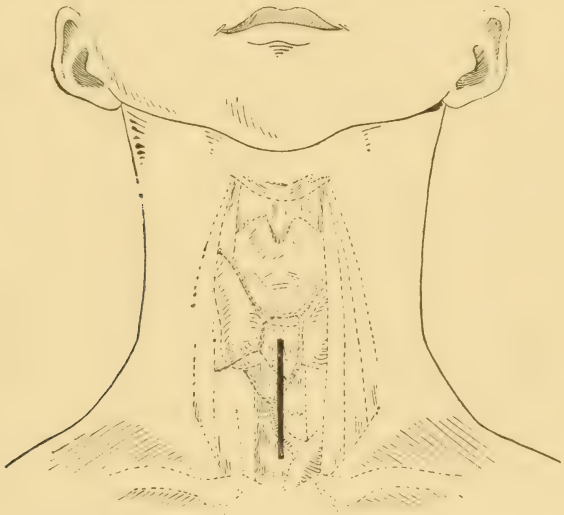


FIG. 119.—Diagram showing the Line of Cutaneous Incision in Infra-thyroid Tracheotomy, and the Relation of the Underlying Structures.

pinkish-red mass, lying upon the second and third rings of the trachea. The deep fascia should now be seized, opposite the lower border of the thyroid isthmus, with the mouse-toothed forceps, lifted up, and nicked with a knife or pair of scissors. A grooved director should then be passed beneath it, from above downward, and, the fascia being raised, any blood-vessels that it may contain are thus brought into view and ligated or clamped, as may seem preferable. The fascia being incised upon the director and drawn apart by the retractors, we come down now upon the trachea, covered with a certain amount of loose cellular tissue through which the veins which compose the thyroid plexus course.

The wound should now be explored by the index-finger, and the trachea and tissues immediately about it palpated to detect the

possible existence of any pulsating vessels. The cellular tissue covering the trachea with its veins is now pushed aside with the index-finger, or, better still, perhaps, with the handle of the scalpel, and the trachea brought into view. This is now seized by a sharp hook, lifted from its bed, and brought under closer inspection, when, if its anterior surface is found free from blood-vessels, an incision is made, by means of the sharp-pointed bistoury, sufficiently long to admit of the insertion of the tube. (See colored plate.)

The edges of the tracheal wound should now be held apart by means of the dilators, and the patient be allowed to cough, to expel such blood as may have made its way into the air tract.

Occasionally, when the trachea is first opened, and held open in such a way as to enable the patient to fully respire, a single deep inspiration is taken, after which breathing seems to cease for a time. This is not an unusual occurrence, but to an inexperienced operator might excite serious apprehension.

The tube is now inserted, and secured *in situ* by means of the tapes about the neck, when the wound is closed and the integument brought together by proper sutures.

The use of Trousseau's or Delaborde's tracheal dilators, or a pilot trocar, to facilitate the insertion of the tube, I do not think necessary. In my own experience, the former instruments have proved, not only awkward of manipulation, but the blades are so much in the way as to hamper the insertion of the tube rather than to help it. The pilot trocar I do not consider necessary if the edges of the tracheal wound are properly held apart in the manner already detailed. Some surgeons advise that two silk threads be passed through the trachea, one on either side of the median line, and that subsequently the incisions be made between them; in this way the edges of the wound can be drawn apart for the insertion of the tube; and, moreover, it is claimed that the mucous membrane, being enclosed in the loop, is less apt to be pouched in the primary tracheal incision. This latter accident is one that can easily happen, but when it occurs it should be recognized and promptly corrected by a subsequent incision, either with the sharp-pointed bistoury or curved scissors.

Accidents and difficulties such as this, which arise during the performance of this operation, are in many instances, I think, in no small degree the result of imperfect illumination; hence, too great importance cannot be attached to the use of the concave reflecting head mirror for thoroughly illuminating the parts during the procedure. Artificial light is not necessary, in that with a proper sized head mirror the light from an adjacent window may be so far concentrated by this method as to thoroughly illuminate the parts,

and thus enable the operator to recognize anatomical relations which might otherwise be obscure.

A number of writers have advocated in certain cases the propriety of dispensing with the tube after the operation. Among these may be noted Martin[1] and Packard.[2] The procedure consists in inserting either silk or wire sutures into the edges of the incision, and maintaining traction by uniting the threads at the back of the neck. Wyeth,[3] in a case of foreign body in the bronchus, successfully sutured the tracheal rings to the integument. The main advantage in dispensing with the tube is that, in case of a foreign body in the air tract, it is more easily expelled when dislodged, and in cases of fibrinous exudation, also, the membrane, when detached, is voided with greater facility. As securing the same object, Braatz[4] has devised an instrument, which he calls a tracheal speculum; this is practically an automatic retractor, whose action does not differ notably from the tracheal retractor of Minor, shown in Fig. 92.

There can be no question of the propriety of temporary resorts of this kind. Thus, in a case reported by Lee,[5] in the absence of a proper canula, the tracheal wound was kept open for twelve hours, until a tube was obtained. In ordinary cases, however, I think the surgeon will feel a greater sense of security, after a successful tracheotomy, where a suitable canula is properly inserted and firmly secured *in situ* than when impromptu dilators are used or sutures are inserted, which must necessarily require careful and constant watching. We do not usually consider the maintenance of the tube in position as a matter of any great difficulty, and yet where tracheotomy is done on a young child, the displacement of the tube is an accident the possibility of which should always be borne in mind. When this occurs, the reinsertion of the canula may be attended with no little difficulty, and in many instances will necessitate the complete reopening of the wound. As avoiding this danger and as a precautionary measure, I think it well in all cases during the performance of the operation to insert a stout silk thread or, better still, a silver wire into the trachea on either side of the incision. A loop is then formed, which is carried out upon the neck, and allowed to remain. If in such a case dyspnœic symptoms supervene, and in the investigation of which it seems wise to remove the tube, this can be done with perfect safety, and the pa-

[1] Trans. of the Amer. Med. Ass'n, 1878.
[2] New York Med. Record, vol. xxvii., p. 638.
[3] Ibid., vol. xxvi., p. 552.
[4] Centralblatt für Chirurgie, Sept. 23d, 1882.
[5] New York Med. Record, vol. xxvii., p. 514.

tency of the trachea maintained by traction on the sutures. Furthermore, this very markedly facilitates the reintroduction of the canula. In this manner, the removal of the tube can be safely trusted to an attendant. An additional advantage here lies in the fact that, if false membrane in the trachea becomes detached or invaginated, thus producing dyspnœa, the prompt removal of the tube will usually facilitate its expulsion. The insertion of these threads is a very simple procedure which in no way complicates the operation, and may be of very material assistance in case of emergency.

Supra-thyroid Tracheotomy.—In this operation the cutaneous incision (see Fig. 120) commences in the median line opposite the

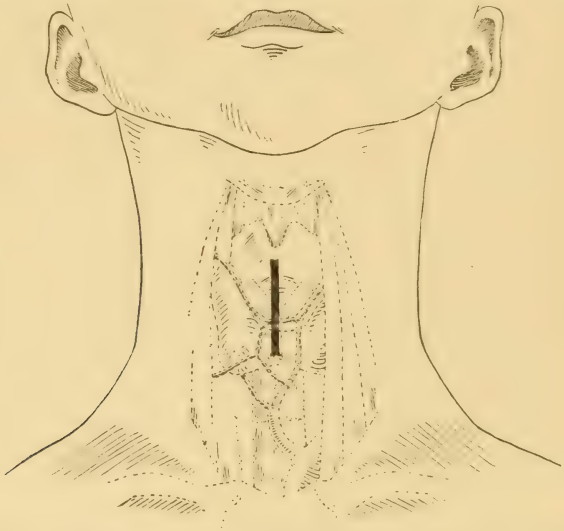


FIG. 120.—Diagram showing the Cutaneous Incision for Opening the Air Passages above the Thyroid Isthmus, and the Relation of the Underlying Structures.

middle of the thyroid cartilage and extends downward from two to three inches, as may seem necessary. On cutting through the superficial fascia, the sterno-hyoid muscles are met with, and separated by means of retractors in the hands of an assistant. This brings into view the deep fascia, with the thyroid isthmus showing through it in the lower portion of the wound. The parts are now thoroughly cleared of such areolar tissue as may be found, by the use of the scalpel handle, when an inspection of the wound will enable the operator to determine the relation of the isthmus to the tracheal rings. If sufficient room is found for the insertion of the tube, the deep fascia is incised longitudinally in the median line and retracted, whereupon the trachea is reached. If, however, the thyroid isthmus lies high up, a transverse incision will be necessary

through the deep fascia, over the cricoid cartilage, above the isthmus, and of sufficient length to admit the handle of the scalpel. This is then inserted from above and passed down between the thyroid isthmus and the trachea, and the former lifted and pressed downward in such a way as to expose the first two or three tracheal rings. The space thus gained is secured by means of a retractor, after which the trachea is seized with a tenaculum and the first two or three rings incised. The subsequent steps differ in no essential degree from those already described in the performance of the lower operation.

Laryngo-Trachcotomy.—This operation differs from the one last described only in the fact that the incision is carried upward through the cricoid ring and into the crico-thyroid membrane. The serious objection to it lies in the fact that it involves a comparatively extensive cartilaginous section, and may result in necrosis of the cricoid from the pressure of the tube. Moreover, it encroaches upon the larynx. It is very rarely performed, and its main justification is in a case of abnormally high position of the thyroid isthmus, which does not admit of a lower incision. It is very rare, however, that this body cannot be sufficiently depressed to permit incision through the upper rings of the trachea.

Crico-thyroid Laryngotomy.—In this operation the incision into the air passages is confined to the crico-thyroid membrane. It is an exceedingly simple operation, may be rapidly performed, and is practically unattended with hemorrhage. Hence, it is especially valuable where the urgency of the case is very great.

It can be only resorted to temporarily, however, because the tissues of the larynx are far more sensitive than those of the trachea, and a tube in this position is not easily tolerated, and may not only excite inflammatory reaction, but interfere with vocal function, from its nearness to some of the muscular structures which act upon the glottis. Moreover, this space will only admit of a comparatively small tube. A larger breathing space would be obtained, of course, by the insertion of a broad, flat tube more nearly adapted to the configuration of this space. It is scarcely necessary to add that, if there were time to provide a special tube, there would also be time to resort to a more justifiable procedure in the insertion of a canula lower down. In performing the operation, an incision is made in the median line, extending from the thyroid notch downward from an inch to an inch and a half. This is carried well through the integument, which, being drawn aside, the thyroid and cricoid cartilages are exposed. Such areolar tissue and superficial veins as are found are pushed aside by the handle of the scalpel, and the crico-thyroid membrane brought into

view. This is punctured vertically, and subsequently a transverse incision is made through the whole extent. The crico-thyroid artery, running closely upon the lower border of the thyroid cartilage, is easily avoided, with a knowledge of its position. The possibility of the extension of the thyroid isthmus to this region is always to be borne in mind. The insertion of the tube is of course attended with no difficulty, other than the extent of the space which limits its size.

Median Tracheotomy.—If it becomes necessary from any cause to insert a tube into that portion of the trachea which is covered by the thyroid isthmus, it seems scarcely necessary to say that our first efforts should be either to depress or raise this body in such a manner as to give sufficient access to the tracheal rings for incision. Failing this course, two ligatures should be passed beneath the isthmus, one on either side, and the part ligated in such a manner as to permit of its being divided in the median line, after which the remaining steps of the operation can be easily concluded in the manner already described.

Rapid Tracheotomy.—The operations above described involve carefulness of detail and recognition of anatomical relations. It may be necessary occasionally, either on account of the urgency of the case or the necessity of doing the operation without sufficient light to enable the operator to recognize the anatomical relations, to perform what is called a rapid tracheotomy. Saint-Germain[1] has done two hundred and twenty-seven tracheotomies, without a grave accident, in the following manner:

The larynx and trachea are firmly grasped between the thumb and first two fingers of the left hand in such a way as to draw them forward from the spinal column, while at the same time the skin is rendered somewhat tense and immovable over the parts. A bistoury is then plunged directly through the crico-thyroid membrane, and then by a sawing movement the cricoid cartilage and the upper rings of the trachea are cut through from within outward. In withdrawing the knife, the cutaneous incision is extended down somewhat farther. The tube is then immediately inserted. Durham,[2] on the other hand, seizing the larynx in the same manner, pulls it forward and cuts from without inward, making his incisions rapidly until the tracheal cartilages are reached, when he either opens the windpipe in the same way or seizes it with a tenaculum and opens it more deliberately. He reports having done this in twenty-three cases, with no untoward accidents. While these operations may be rendered necessary in

[1] Gaz. des Hôpit., Jan. 15th, 1881.

[2] Holmes' "System of Surgery," 3d ed., vol. i., p. 775.

certain cases, they certainly cannot be commended as surgical procedures.

AFTER-TREATMENT.—The indications for after-treatment in the case of tracheotomy are sufficiently covered in the recognition of the fact that the normal respiratory act is carried on through the nasal passages, and that in traversing these passages the inspired air: first, is warmed to practically the normal temperature of the body; second, that it is so far surcharged with moisture as to render it practically saturated; and, third, that it is cleansed from impurities by the extraneous matters which it contains lodging upon the moist surfaces of the nasal mucous membrane. When a canula is inserted into the trachea, these important functions of the nasal chambers with reference to respiration are practically abolished, and hence the after-treatment in any case of tracheotomy consists in such measures as will, as far as possible, supply the deficiency which the operation has entailed.

In an acute case, and in all cases for a certain period after the tube has been inserted, the room should be kept at a temperature of fully 75°; it should be fully surcharged with moisture; and in addition to this the tube should be covered with a number of layers of thin gauze, which should serve to filter the inspired current of air, without in any degree hampering the free entrance of air to the lungs. In addition to this, the gauze should be frequently moistened, in order that the inspired air may as far as possible be thoroughly saturated.

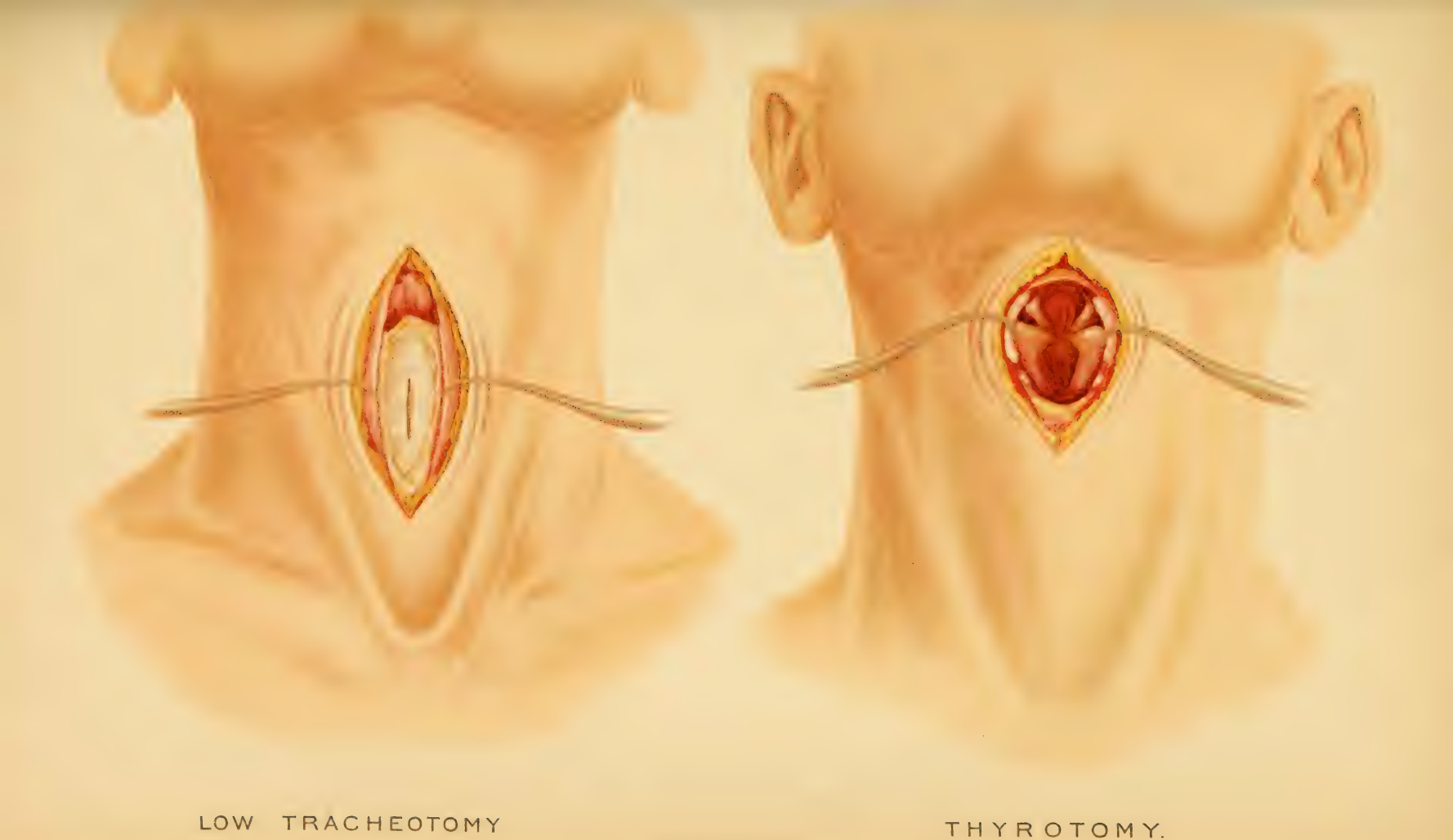
The discussion of the question of surcharging the atmosphere with medicated solutions, for the control of such inflammatory conditions as may exist in the air tract, need not be entered upon in this connection, though their use, of course, will not be neglected in any given case.

Where a tube is inserted for a chronic laryngeal stenosis, with the prospect of its being either a prolonged or permanent necessity, the precautions above detailed should for the while be borne in mind, and to a certain extent carried out. Even in such a case as this, however, nature seems to adapt itself in a remarkable way to new situations, and certainly, in my own experience of such cases, the canula seems to be worn with a certain degree of immunity to the mucous membrane of the air tract, the only precaution that is necessary being that the mouth of the tube should be covered with a few thin folds of gauze or silk, to prevent the entrance of insects or floating impurities in the atmosphere.

REMOVAL OF THE TUBE.—There are certain accidents which may result from the wearing of a tube, which interfere with its withdrawal even after the disease for which the trachea has been

opened has subsided. A number of cases have been observed in which granulations sprung up about the wound to such an extent as to cause notable stenosis. This, of course, only occurs after the tube has been worn for a considerable period. After the passage of air through the larynx has been abolished for a considerable period, its sudden restoration by the removal of the tube and the closing of the tracheal wound may excite a glottic spasm. Another accident referred to by Mackenzie[1] is bilateral paralysis of the abductors. How this should occur it is difficult to understand. It might possibly result from the insertion of a tube through the cricoid cartilage, or from local changes the result of the presence of a canula. If the respiratory movements of the glottis were abolished by opening the trachea, the abductor muscles might undergo degeneration from lack of use. At best, however, such an accident is a remote possibility. In withdrawing the tube, however, the larynx should be thoroughly examined by means of the laryngoscope and its patency observed, as well as the laryngeal movements, and especially should granulations be sought for. Of course, before removing the canula, the patency of the air tract should always be tested, by simply closing the mouth of the tube, as in most instances there is abundant breathing space around its periphery, even where a fenestrated canula has not been used. In no case should the tube be retained longer than is absolutely necessary, since, the longer the tube is *in situ*, the greater the danger of granulations forming. Where this occurs, they should be destroyed by efficient cauterization or, if necessary, by the use of the curette. These granulations, of course, are subglottic, and the manipulation necessary for their destruction is made through the tracheal opening. Occasionally it may become necessary to reopen the original wound, to obtain free access to the trachea for their complete ablation.

[1] "Diseases of the Throat and Nose," Amer. ed., vol. i., p. 536.



LOW TRACHEOTOMY

THYROTOMY.

LINDNER LOOY & GRAUSS LITH. N.Y.

CHAPTER L.

EXTIRPATION OF THE LARYNX.

[*See colored plate.*]

PROBABLY no operation in our day illustrates more strikingly the daring and skill of modern surgery than the successful extirpation of the larynx in the human subject. Although it seems to have been successfully done upon the lower animals by Albers,[1] who, in the series of experiments which he performed in the investigation of the function of this organ in respiration, twice removed the larynx of dogs with a fatal result in each case, it was never put in practice in the human subject until Dr. P. H. Watson,[2] of Edinburgh, successfully removed the organ in a man aged thirty-six suffering from tertiary syphilis. The patient had worn a tracheal canula for a year, but the more radical operation was indicated on account of the passage of food and drink into the air tract. Before Watson operated, the feasibility of this procedure seems to have been entertained by Langenbeck,[3] who had detailed the steps by which it might be accomplished in presenting a case before his clinic in 1854. The possibility of the operation had also occurred to Kœberlé[4] and to Hueter.[5] Watson's operation was not reported at the time, and was only made public in a *résumé* of the subject by Foulis.[6] To Czerny[7] is due the credit of demonstrating the feasibility of this procedure in the human subject, as the result of a successful series of experiments on dogs; for while, as we have seen, Albers did the operation on dogs, its applicability to the human subject did not occur to him, while Czerny's experiments were done for the purpose of demonstrating the availability of the procedure in the human subject. Accepting Czerny's conclusions, Billroth[8] soon afterward performed the operation on a man aged thirty-six suffering from carcinoma of the larynx, which had recurred four weeks after an attempt to extirpate it by thyrotomy. This patient survived the operation a year, a degree of success

[1] Graefe und Walther's Jour. der Chir. und Augenheilk., 1829, vol. xiii., p. 244.

[2] Cited by Foulis: Trans. Seventh Internat. Med. Congress, London, 1881, vol. iii., p. 251.

[3] "Akiurgie," Berlin, 1888, p. 420.

[4] Berger: Hayem's Revue des Sciences méd., vol. ix., section 1, p. 298.

[5] Pitha und Billroth: "Deut. Chir.," vol. iii., section 1, pt. 5, p. 99.

[6] Loc. cit.

[7] "Versuche über Kehlkopf-Extirpation," Wien. med. Woch., 1870, Nos. 27, 28.

[8] Gussenbauer: Arch. für klin. Chir., vol. xvii., p. 341.

which immediately placed laryngectomy among the recognized and justifiable surgical procedures in cases of malignant disease of the larynx.

Since Billroth's first operation, laryngectomy has been performed in something over one hundred and fifty cases of carcinoma and sarcoma, and in exceedingly rare instances for less grave affections. The results of these operations have already been discussed in the chapters on carcinoma and sarcoma of the larynx, and need not be further entered upon here, except to repeat the statements there made, where we learn that in 138 cases of laryngectomy for laryngeal cancer, as collated by Mackenzie,[1] 13 were to be regarded as successful; while of 11 cases where the operation was done for sarcoma, 3 were successful.

INDICATIONS FOR THE OPERATION.—In addition to carcinoma and sarcoma, the larynx has been extirpated for syphilitic cicatrices, papilloma, lupus, and perichondritis. When we consider that in itself the operation involves not only immediate and grave dangers to life from shock and hemorrhage, and also that it may be followed by serious complications, such as pneumonia, pleurisy, and septicæmia, the propriety of subjecting a patient to these dangers becomes a serious question, unless life be threatened by the gravity of the laryngeal disease. I should find it difficult, therefore, to justify the resort to such a radical procedure in any case other than malignant disease, unlesss some unusual condition existed. Moreover, a prudent surgeon would scarcely assume the responsibility of operating in malignant disease of the larynx unless the morbid process was still largely confined to the laryngeal cavity. Fortunately in these cases, as we know, an intrinsic laryngeal cancer shows notable hesitancy in extending to contiguous structures, and hence, even after the disease has persisted for some time, the removal of the larynx offers a hope of the complete extirpation for the time being of the malignant process.

Restricting, then, the indications for laryngectomy to malignant disease of the larynx, it seems scarcely necessary to add that an early resort to surgical interference, where the diagnosis is thoroughly established, offers the best hope for the relief of the patient, for although, as we have seen, success has been obtained in but ten per cent of the cases operated upon, a study of the reports of these cases would seem to indicate that this percentage might perhaps be rendered more favorable had the extirpation been done earlier in the history of the disease.

THE OPERATION.—In a majority of the cases where the opera-

[1] "The Case of Emperor Frederick III.," Amer. ed., New York, 1888, p. 266.

tion has been done, the diseased condition had already rendered necessary the insertion of a tracheal canula for the relief of dyspnœa. Where this has not been necessary, many operators advise that a preliminary tracheotomy be done from one to two weeks before the more radical operation is attempted. I can easily see why this should be a wise procedure where the vital powers of the patient are depressed by the deficient oxygenation which a long-continued laryngeal stenosis might entail. If, however, this special indication does not exist, I see no objection to inserting the tracheal tube at the same time the laryngectomy is performed. This question, however, is one which will necessarily be decided by the special conditions which present in each individual case. A number of operations have been done without the insertion of any tracheal tube, a properly fitting tube being at hand for insertion

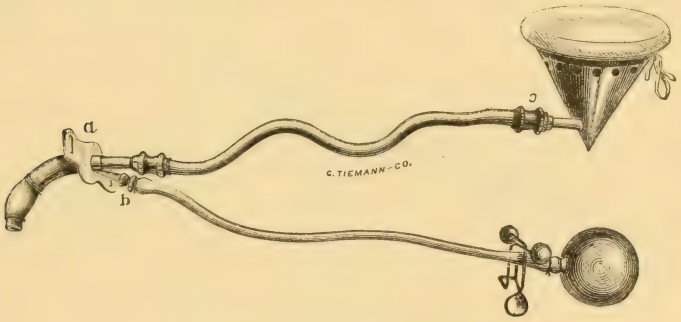


FIG. 121.—Trendelenburg's Apparatus.

into the proximal end of the trachea as soon as this is divided in the operation. The advantage of this latter procedure lies in the fact that the air passages are not opened until the trachea is cut through. In this way one of the greatest difficulties in the performance of the operation is avoided, namely, the flow of blood into the trachea, which might give rise to serious dangers and complications. In order to avoid this flow of blood into the trachea during the operation, a number of specially devised instruments have been constructed. In Fig. 121 is shown Trendelenburg's[1] apparatus, which consists of an ordinary tracheal canula fitted for about a half an inch of its distal extremity with a rubber sheath. The small canula, to which a rubber pipe and bulb is attached, is so arranged that air can be forced between the tube and the rubber sheath in such a way as to inflate the rubber, thus filling up the space between the tube and the inner wall of the trachea and preventing the passage of blood into the parts below. An inhaling apparatus is also con-

[1] Berliner klin. Woch., 1871, No. 19.

nected by a rubber tube with the upper extremity of the tracheal canula, thus facilitating the administration of the anæsthetic at a distance from the operator. I have used this apparatus in a number of instances, but never with satisfaction, in that the distention of the sheath seems to arrest respiration. Whether this is the result of reflex action from pressure on the tracheal membrane, or from the rubber sheath extending over and blocking up the distal end of the tube, I am in doubt. A more efficient and less objectionable device is that of Gerster,[1] seen in Fig. 122, which consists of a number of delicate steel springs placed longitudinally around the lower end of the tracheal canula and covered by a rubber sheath. By turning a thumbscrew attached to the upper extremity of the neck plate, these springs are made to bulge outward in such a manner as to completely fill the intervening space between the canula and the tracheal wall. It is provided with an inhaling apparatus similar to

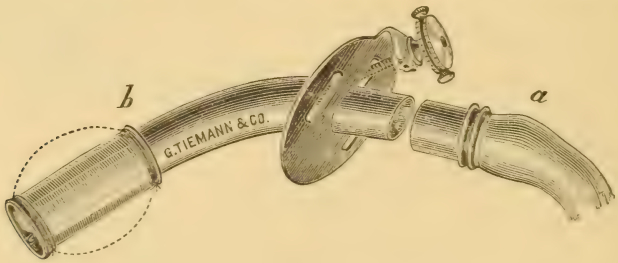


FIG. 122.—Gerster's Tampon Canula.

that of the Trendelenburg device for administering an anæsthetic. Michael[2] accomplishes the same purpose by firmly attaching a properly fashioned piece of compressed sponge to the lower end of the canula, and covering it with gold-beater's skin, attached below, but not above. After insertion, the moistening of the sponge causes sufficient swelling to tampon the trachea. Hahn,[3] on the other hand, simply invests the tracheal end of the tube with a layer of compressed sponge which has been impregnated with a saturated solution of iodoform and ether, omitting any external covering.

If the trachea is cut through at the earlier part of the operation, as before suggested, the lower segment is pulled forward and a tube inserted, and hence these devices are unnecessary. If, on the other hand, the first dissections are made about the upper portion of the larynx, blood necessarily will enter the air tract, and hence some form of tampon canula will be rendered absolutely essential.

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[1] New York Med. Record, vol. xix., pp. 218, 331.

[2] Wien. med. Woch., 1882, No. 37.

[3] "Sammlung klin. Vorträge," No. 260; Chirurgie, No. 82.

In such cases preference, I think, should be given either to Gerster's device or that suggested by Michael.

The details of the operation are as follows: A longitudinal incision is made through the integument in the median line, extending from the hyoid bone to the third or fourth ring of the trachea. If high tracheotomy has previously been done, the incision will necessarily be extended into the original wound. If low tracheotomy has been done, it will be better that an interval of normal integument should be, temporarily at least, allowed to intervene. In order to obtain wider access to the region for later manipulation, an additional incision may be made transversely

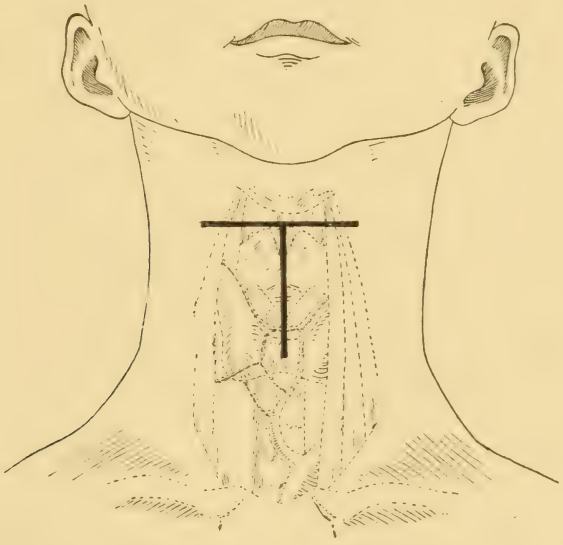

FIG. 123.—Line of Cutaneous Incision for Excision and Resection of the Larynx, with the Relative Position of the Deeper Structures.

along the line of the hyoid bone, at the upper end of the longitudinal incision (see Fig. 123). The soft tissues covering the thyroid cartilages are now pushed aside by means of the handle of the scalpel, and the whole cartilaginous framework of the larynx gradually uncovered by this means and by dissection. The first artery encountered is the crico-thyroid, which should be ligated. If the morbid process in the larynx is still intrinsic and does not involve the external tissues, perhaps the best method to follow now is to incise the perichondrium from the supra-thyroid notch downward in the median line and separate it from the cartilage, first on one side and then on the other. With the removal of the perichondrium, the overlying muscles are detached *en masse*. This separation can be done with the ordinary elevator, or perhaps with the handle of

the scalpel. This perichondrial separation is carried backward to the posterior border of each thyroid ala, and the same process repeated on the cricoid ring. After this has been done, the transverse incision is deepened, and the thyro-hyoid membrane exposed and incised along the upper border of the thyroid cartilage. The superior laryngeal artery is cut with this incision, and will require ligation, or it may be sought for and a double ligature placed about it previous to division. The thyroid cartilage is then freed in such a manner that it can be pulled forward somewhat by means of a blunt hook, when by digital exploration the superior cornu is found, with the lateral thyro-hyoid ligament, which is cut through. The same process is now repeated on the opposite side.

The subsequent steps will depend on whether the epiglottis shall be removed or left *in situ*. The earlier operators endeavored to leave this organ, with the idea that its special function might be preserved. Clinical experience has shown that even in cases where the malignant process has not attacked this portion of the larynx, its function is practically abolished, in that no artificial apparatus has yet been devised to which the epiglottis can adapt itself in preventing the entrance of food into the larynx. Practically it is a hindrance rather than a help in the subsequent management of the case. It will probably be better, therefore, in most instances, to remove it with the other portions of the larynx, without regard to the question whether it is involved in the diseased action or not. If it is left in position, the subsequent steps of the operation will consist in carrying the incision through the thyro-hyoid membrane directly across from one side to the other, following closely the upper border of the cartilages, thus cutting directly through the epiglottic petiolus. If the epiglottis is to be removed with the remaining portion of the larynx, the thyro-hyoid incision is carried higher up near the lower border of the hyoid bone, in order to avoid severing the epiglottic attachments. The larynx now is only held in position by its attachments to the yielding œsophagus, and hence is easily tilted forward to a considerable extent, when its posterior wall is brought into view with the œsophageal entrance. The larynx is now drawn forward by means of a vulsellum, and its attachments posteriorly severed by careful dissection. The most serious accident that can occur at this stage of the manipulation lies in the danger of "buttonholing" the œsophagus. This is avoided by inserting the index finger or a sound into this passage, and conducting the subsequent dissections with this as a guide, taking care always that the edge of the knife shall incline forward and be made to closely follow the laryngeal cartilages. In this way the dissection is carried on from above downward, until the

whole of the larynx is cleared from its posterior attachments down as far as the first ring of the trachea, or lower if necessary. During this dissection we encounter the middle laryngeal artery, which is to be treated in the same manner as the superior laryngeal. The point of tracheal section having been decided upon, the operation is completed by cutting through the trachea at such point, two sutures previously having been inserted into the trachea below the selected point of section, for the purpose of attachment to the integument. The destruction of the tracheal supports in the removal of the larynx may give rise to one of the most serious complications which follow the operation, in that, on account of the removal of these attachments, the trachea has a tendency to sink into the thorax. This is avoided in the manner above stated, of sutureing the lower fragment to the integument. An additional security can be afforded also in those cases where a low tracheotomy has been done, by sutureing the edges of the incision at this point to the integument, although, if the canula has been *in situ* for some time, the cicatricial adhesions which have resulted from the wound will of course do away with any indications for sutureing at this point.

In the above operation, as we have seen, the only notable arteries encountered are the superior and middle laryngeal arteries and the inferior laryngeal or crico-thyroid artery. In a case, therefore, of intrinsic cancer which has assumed large proportions, the above operation is accomplished without the danger of troublesome hemorrhage. Laryngectomy is generally regarded as an exceedingly bloody operation. This applies to those cases in which the morbid process has assumed large proportions and has resulted in an extensive distortion of the organ, as a result of which small arterial branches have acquired considerable size and are encountered in unexpected places. Thus, in one of Langenbeck's[1] cases forty-one ligatures were necessary. Undoubtedly the advantages are decidedly in favor of operating from above downward, in that in this way the incision into the air tract is made the last step of the operation, thus very largely avoiding the danger of blood flowing into the trachea. Moreover, it would seem that the extent of the diseased process can be more easily estimated by commencing the operation above, and the extent of the operation decided upon with a greater degree of nicety, than where the manipulation is done the reverse way.

The exigencies of the case or perhaps the choice of the surgeon may dictate the advisability of commencing the operation below. In this case the general steps are much the same as those already described, only the procedure is reversed. In this operation the

[1] Berl. klin. Woch., 1875, p. 453.

preliminary tracheotomy may be dispensed with. The primary incision is made as before described. The trachea is then uncovered, drawn forward by a tenaculum and incised at the point of section, when the lower fragment, being drawn forward, a tube is inserted, and subsequently the upper fragment is lifted from its bed and the dissection carried on from below upward. In this manipulation the lower fragment is to be secured to the integument by means of sutures, as before, especial care being taken that the canula should be so inserted into the trachea, and so tightly tamponed, that no blood can pass into the air passages.

We have thus described the method of procedure in a typical case of laryngectomy. The operation, of course, will necessarily vary in different cases, according to the special conditions which present. The extent of diseased action cannot always be accurately determined before operation, and the surgeon will be compelled to vary both his primary incision and his subsequent dissections, according as the disease may be found to have extended into the pharynx, or perhaps to the base of the tongue above, or into the œsophagus below, or according as the necessity presents for dissecting out diseased lymphatic glands wherever found.

AFTER-TREATMENT.—After the operation has been completed, and all hemorrhage or oozing has ceased, the wound should be thoroughly cleansed by a corrosive sublimate solution of the strength of 1 to 5,000. The whole wound then is packed with iodoform gauze, a soft rubber catheter having been previously inserted into the œsophagus and the tracheal canula maintained in position. The looser folds of integument at the extremities of the original cutaneous incision may be drawn together by a few sutures. The main portion of the wound, however, should be left open and supported by temporary dressings. Food and drink for the first few days should be administered entirely through the œsophageal catheter, although at the end of the fourth day, the patient should be encouraged to make the attempt to take some fluid through the natural passages. If low tracheotomy has been previously done, the tube should remain in position for three or four days after the operation, when it can be removed and the patient allowed to breathe through the upper opening of the trachea, if feasible, or possibly it may be necessary to insert a tube at this point, the local dressings being modified to admit of this. During the following fortnight the closest attention will be demanded to meet such conditions as may arise, and to give such aid to the patient as may be possible as he gradually adapts himself to the new conditions which the removal of such an important organ has entailed. The stomach tube is removed at the end of the fourth

or fifth day, and as the patient acquires the ability to swallow naturally it may be left out permanently, although its frequent reintroduction may be necessary, either through the wound or through the mouth. The healing process goes on somewhat rapidly, and at the end of two or three weeks the parts will have assumed, under the process of cicatrization, somewhat of their ultimate contour, when an attempt may be made to supply an artificial apparatus to take the place of the organ which has been removed. This of course should not be attempted too early, in that the impact of the metallic instrument is liable to produce erosions and possibly serious hemorrhage.

THE ARTIFICIAL LARYNX. — In quite a number of the cases in which the larynx has been extirpated, the attempt has been made to fit an artificial apparatus to supply the place of the organ which had been removed. These efforts have not usually been attended with notable success, although in a number of instances the patient has been enabled to articulate clearly, and thus to carry on a conversation with considerable ease, although of course the voice is monotonous and somewhat metallic in character. In Fig. 124 is shown the apparatus devised by Gussenbauer[1] for one of Billroth's cases. It consists practically of an ordinary tracheal canula B, to which is fitted a second tube A, extending upward and opening into the pharyngeal cavity. There is thus established a continuous channel, by means of which the expiratory current of air can be directed up to the oral cavity. By inserting the vibrating reed C into the continuity of this channel, and closing the cervical aperture of the canula, this expiratory current is thrown into vibrations which are subsequently converted into articulate language by the lips, tongue, etc., as in the normal process. A serious difficulty which has been encountered in fitting these devices has been in preventing the oral and pharyngeal secretions, as well as food and drink, from making their entrance into the air passages from above.

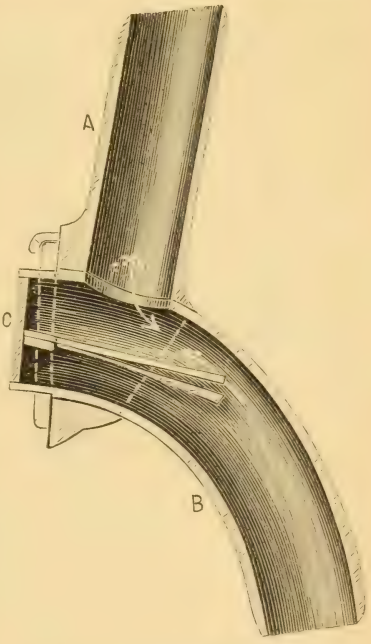

FIG. 124.—Gussenbauer's Artificial Vocal Apparatus.

[1] Archiv für klin. Chirurg., 1874, vol. xvii., p. 343.

This is not successfully accomplished by the epiglottis, as a rule, when this organ has been left *in situ*. Gussenbauer fitted an artificial epiglottis to the upper end of the oral tube, in the form of an automatically closing hinged cap, which served a fairly successful purpose. In Fig. 125 is shown a modification of Gussenbauer's in-

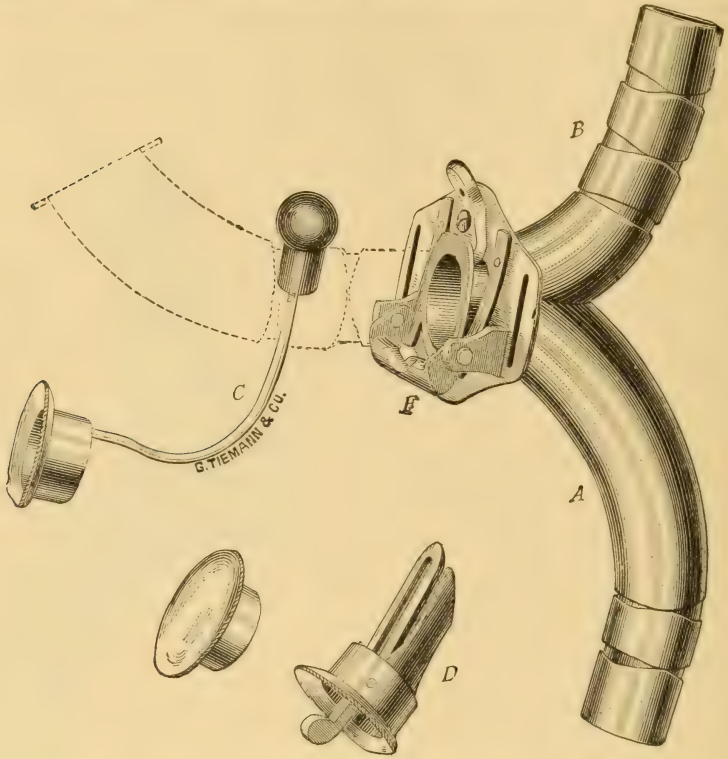

FIG. 125.—Roswell Park's Artificial Vocal Apparatus.

strument devised by Park,[1] in which the upper tube is closed by a plug, C, as shown in the cut. This may be withdrawn upon the insertion of the reed D. In addition to this, both the upper and lower tubes are constructed with a lobster-tail joint.

[1] Annals of Surgery, St. Louis, 1886, vol. iii., p. 28.

CHAPTER LI.

RESECTION OF THE LARYNX.

[*See colored plate.*]

THIS term is generally used to designate the more or less complete removal of one lateral half of the larynx; although technically it may include any operation which involves removal of any portion of the laryngeal cartilages. It was first done by Heine[1] in a case of ossifying chondro-perichondritis, in a syphilitic subject, giving rise to notable stenosis. He opened the larynx by a median incision, and, after separating the external and internal perichondrium, sliced off the diseased cartilage until sufficient had been removed to establish a permanent opening for breathing purposes.

The indications for the operation are practically confined to instances of malignant disease which have not become generalized, and, as in Heine's case, to cases of syphilitic stenosis. The amount of tissue to be removed, therefore, and the parts to be excised, will necessarily vary to a certain extent in each individual case. We content ourselves in the present consideration in describing the successive steps of the operation for the complete removal of one lateral half of the larynx.

THE OPERATION.—A longitudinal incision is made through the integument in the median line, extending from the hyoid bone to below the cricoid ring. The upper extremity of the incision is then extended horizontally on the side which it is desired to remove, as far as the greater cornu of the hyoid. The longitudinal incision is then carried well down upon the thyroid cartilage, when the lateral flap is dissected up, together with the perichondrium of the thyroid cartilage. The arteries encountered here are the superior, middle, and inferior laryngeal or the crico-thyroid, and may need ligation. When the thyroid ala has been completely denuded of its perichondrium as far back as its posterior border, the cartilage should be cut through in the median line, as in thyrotomy, thus gaining free access to the laryngeal cavity. The edges of the wound should now be thoroughly retracted and the cavity of the larynx explored, the extent of the diseased process recognized, and the various land-

[1] Chirurg. Congress, 1875, vol. ii., p. 222.

marks established, to aid in the subsequent manipulation. These points having been determined, the attachment of the thyro-hyoid membrane along the upper border of the cartilage should be severed, when the ala is seized by a stout pair of forceps, drawn well forward, and its attachments posteriorly and inferiorly cut through, either by means of a bistoury or, better still perhaps, with the curved scissors. The wound should now be carefully dried, and an effort made to determine how much of the lining membrane of the larynx, or what diseased tissue, has been extracted with the fragment already removed. Usually the incision will have extended through the ventricular band, and also anteriorly through the vocal cord. The orifice of the œsophagus should now be sought and a sound inserted, when the arytenoid cartilage can be seized and excised by means of the scissors. The further steps of the operation consist simply in searching for evidences of the morbid process, and the removal of such portions as excite suspicion of having been invaded.

As a rule, where a simple exsection rather than laryngectomy is indicated, the morbid process will not have invaded the epiglottis. If this organ is diseased, of course it can be either completely excised or one-half of it removed by means of the scissors. If the cricoid cartilage is found invaded, its removal in a manner similar to that of the thyroid ala involves no special difficulties.

As regards the preliminary insertion of a tracheal canula, the same rule applies here as in the case of complete extirpation of the larynx: there can be no question that the previous introduction of a tracheal tube greatly simplifies the operation. I know of no reason why this should not be done at the same time that the radical operation is attempted.

After-Treatment.—After the operation is completed, the wound should be packed with iodoform gauze, and the flaps brought together and supported by loose adhesive strips. Deglutition is somewhat difficult and perhaps painful, but by no means impossible, after this operation; and although occasionally it may be necessary to make use of the stomach tube for the first twenty-four to forty-eight hours, the patient very soon is enabled to swallow fluids effectively and with no great discomfort. At the end of the second or third day an attempt should be made to close the external wound, although if there is much suppuration it may be wise to insert a small drainage tube in its lower portion. During the first few days the tampon canula is to be retained in position in order to prevent the entrance of the discharges into the air tract. As soon as feasible, the ordinary fenestrated canula should be tried and the attempt made to breathe through the natural passages.

UNILATERAL RESECTION OF THE LARYNX

EXTIRPATION OF THE LARYNX.

LINDNER EDDY & CLAUSS LITH N.Y.

The effect of removing half of the larynx is necessarily to destroy the voice, and yet, as the parts heal, the effort of nature to adapt herself to the new conditions is attended with no little success, in that not infrequently the tissues of the diseased side solidify to such an extent that the approximation of the healthy vocal cord to them forms a glottis capable of producing a fair degree of phonation.

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